DIV. OF FISHES

COMMERCIAL FISHERIES Review

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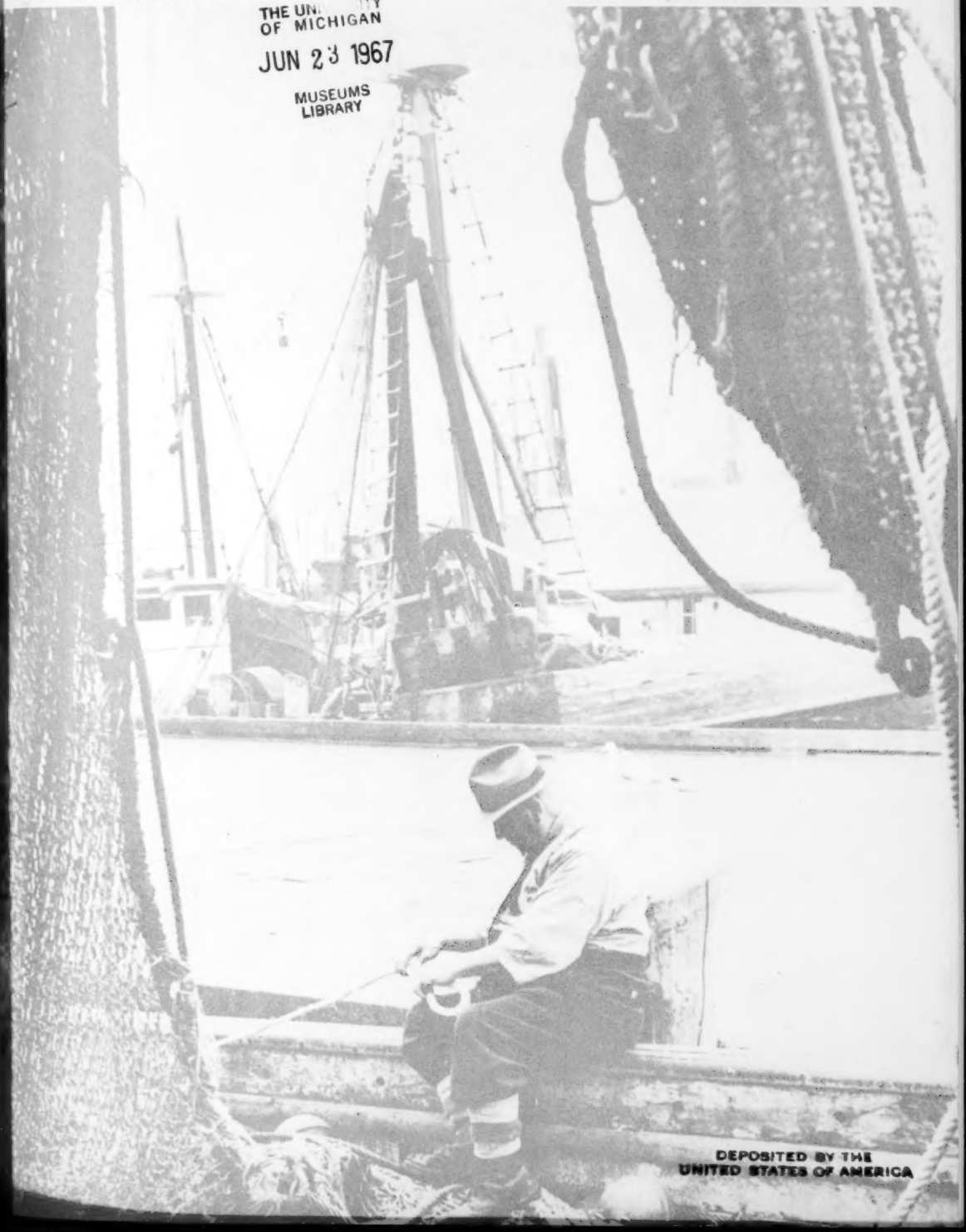

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COVER: Seated on trawler rail in Gloucester, Mass., port, veteran fisherman mends his gear. (Photo: USIA/National Archives)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL—GLOUCESTER, MASS.

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Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

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Captain of gill netter checks his catch--mostly cod. (Photo: USIA/National Archives)

PRESIDENT ISSUES FIRST REPORT ON MARINE SCIENCE AFFAIRS

President Johnson has issued the first report to the Congress on marine resources and engineering development. Entitled "Marine Science Affairs--A Year of Transition," it is the work of the National Council on Marine Resources and Engineering Development, chaired by Vice President Humphrey.

The Council, created in 1966, advises and assists the President in planning policy and coordinating the marine science programs of 11 Federal agencies.

The President states that the oceans' resources can help meet many of the challenges facing the Nation and the world. He emphasizes these points:

- "The vast food reserves of the sea must be developed to help end the tragic cycle of famine and despair."
- To safeguard human health and protect the sea's resources, we must stop, and then undo, the continuing pollution and erosion of seashores, bays, estuaries, and the Great Lakes.
- We must understand better the influence of oceans on the environment "to improve long-term forecasting of storms, weather, and sea conditions; protect life and property in coastal areas; and improve the prediction of rainfall in the interior."
- We must take the wealth of the ocean floor to benefit mankind.
- "Finally, the seas must be used as pathways to improved international understanding and cooperation."

Fig. 1 - Weather balloon launched from ships to gather information on upper air. Weather reports from many ships are used to prepare forecasts for aviation and marine interests. (Photo: ESSA)

The U. S. has recognized the great potential of the seas, the President points out. Over the past 6 years, the U. S. has put more and more money into developing marine scientific and technical manpower, ships, and facilities. "The quality of our research fleet, deep sea vessels, and laboratories is unsurpassed," he notes. The number of highly trained specialists is growing, and this "provides a strong creative base for our marine science and technology."

Fig. 2 - SCUBA diver capturing young salmon for study of fish behavior. (Photo: Oregon Fish Commission)

The President acknowledges the contributions of the 89th Congress to meeting the challenge of the oceans. It enacted:

- The Marine Resources and Engineering Development Act, which calls on the President to develop a long-range, comprehensive, and coordinated U. S. program in marine science--aided by the National Council on Marine Resources and Engineering Development, and an advisory Commission on Marine Science, Engineering, and Resources.
- The Sea Grant College and Program Act. This will improve U. S. capabilities for training and research in marine science and engineering.

Fig. 3 - Red hake is dropped into grinder--producing, after water and fats are dissolved in alcohol, fish protein concentrate (FPC).

Fig. 4 - FPC looks like a light-tan flour and is virtually odorless and tasteless.

• Authorization for pilot plants to produce fish protein concentrate.

The National Council identifies the areas in which the U. S. should carry out these actions:

• Begin a pilot program to help the world's protein-deficient nations increase their capacity to use the ocean's fish resources to feed their people.

• "Implement the Sea Grant College and Program Act to strengthen oceanographic engineering, expand applied research, and improve technical information activities."

• Speed studies to find ways of improving the "collection, storage, retrieval and dissemination of oceanographic data."

• Enlarge the systems of ocean observation to improve near-shore weather prediction services. Study ways to increase the accuracy of long-range predictions of precipitation levels and drought conditions.

• In Chesapeake Bay, determine the effects of estuarine pollution on shellfish, health, recreation, and beauty. Provide a plan to remedy the situation.

• Explore the solid mineral deposits offshore.

• Improve technology and engineering to make it possible to work at great ocean depths.

• Equip a new Coast Guard vessel to carry out oceanographic research in sub-Arctic waters.

President Johnson also notes his recommendation to Congress for a 13-percent increase--from $409 to $462 million--in funds to support marine science activities. The money will permit expansion of the current efforts to understand the sea and develop its enormous resources. It will strengthen the capabilities of private industry, universities, and local government to participate in this undertaking. Also, it will help carry out the recommendations of the National Council.

The report states that significant progress was made in the marine sciences in the 1960s, but the total enterprise today, both public and private, is still small--only about 3 percent of the total U. S. technical effort.

UNITED STATES

Fishery Products Exports Rose 22%

The value of U. S. exports of fishery products rose to a record $84.8 million in 1966--an increase of $15.3 million, or 22 percent, over 1965. Exports were $32.7 million, or 63 percent, greater than the 1961-65 average of $52.1 million. Exports of edible products totaled 109,604,000 pounds valued at $62,882,000. (In 1965, 96,444,000 pounds worth $49,308,000).

Nonedible products were valued at $21,931,000 in 1966 and $20,175,000 in 1965.

There was a large increase in exports of frozen salmon, prepared or preserved fish and shellfish, and unmanufactured shells. Exports of frozen salmon were 9.3 million pounds--88 percent larger than in 1965. Canada, Sweden, United Kingdom, France, and Japan imported larger amounts in 1966. There were no indications of new markets elsewhere.

Exports of prepared or preserved fish (includes canned) increased 5.6 million pounds, or 174 percent. Large shipments went to Japan (4.7 million pounds) and to the Congo (2.5 million pounds). The high value of exports to Japan suggests that they consisted mostly of salmon eggs (soaked in brine, packed in cellophane lined boxes, and frozen) and herring spawn and kelp. The low value of shipments to the Congo indicate mostly canned river herring and Maine herring.

Shellfish Exports

Exports of prepared or preserved shellfish (includes canned) increased 2.4 million pounds, or 60 percent. Large shipments were sent to Sweden, Denmark, United Kingdom, and France. Over one million pounds were sent to France in 1966; only 300,000 pounds in 1965. (Canned king crab and lobster--but not frozen king crab or live lobster--are included.)

Exports of fish oils (77.3 million pounds) were below the 103.8 million pounds exported in 1965. Exports of seal furs were worth $4.1 million; in 1965, $6.1 million. Total exports of nonedible items would have been considerably lower than in 1965 except for the remarkable trade increase in unmanufactured shells. Over 64 million pounds valued at $9.2 million were exported in 1966--compared to 36 million pounds worth $4.1 million in 1965. Of the total, 51.3 million pounds, or 80 percent, were sent to Japan, and 11.3 million pounds, or 18 percent, to Canada. (BCF Branch of Fishery Statistics.)

Breaded Shrimp Production Increased 6%

U. S. production of breaded shrimp during 1966 was 104 million pounds--up 6 percent over 1965.

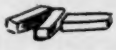
The Inland and Gulf States ranked first with 63.6 million pounds, followed by the Atlantic States, 33.4 million, and the Pacific States, 7 million.

Fish Sticks and Portions Output Rose Slightly

U. S. production of fish sticks and portions during 1966 was 227.9 million pounds worth $93.5 million--up 2.2 percent in quantity and 1.8 percent in value compared to 1965.

Fish sticks totaled 81.3 million pounds in 1966--1.2 million pounds, or 1.4 percent, lower than 1965. Fish portions amounted to 146.6 million pounds--up about 6.2 million pounds, or 4.4 percent.

Cooked fish sticks (about 77 million pounds) were 94.7 percent of the 1966 fish stick total; the remaining 4.3 million pounds, or 5.3 percent, consisted of raw fish sticks.



Gulf Oil Rigs Are Shipping Hazard

The U. S. Coast Guard says that the large increase in offshore oil rigs and related marine structures in the Gulf of Mexico has created a serious hazard to navigation. To stop the rising number of accidents, the Coast Guard's New Orleans district has accelerated its campaign to tell mariners where 7,000 "artificial islands" and "artificial reefs" are located in the waters off Louisiana and Texas.

The Coast Guard was instrumental in establishing "fairways" for shipping. These are 2-mile-wide channels stretching from a port's entrance to deep water and kept free of oil-drilling equipment. The equipment consists of drilling rigs (from fixed-platform to ship-hulled rigs), processing and storage platforms, producing wells and capped wells. Most of the equipment is scattered in the bays and bayous of Louisiana and Texas.

Many Structures Far Offshore

About 2,000 structures are far offshore, some 70 miles from the coast. Moreover, the number of submerged wells (completed and capped underwater) has increased greatly. Made of heavy steel, these wells could severely damage ships.

As oil wells advance farther into the Gulf, the Coast Guard is urging the creation of fairways running parallel to the shore. Without these connections to the access fairways, ships seeking safe passage must travel long and uneconomic distances to the sea.

Maritime interests and the offshore oil industry are looking for an agreement on these "marine highways."

The offshore operation in the Coast Guard's New Orleans district is the world's largest, says the district's commander, Rear Adm. J. D. Craik. His command sees that all structures have lights and fog horns that work properly. All submerged wells coming to within 85 feet or less of the surface must be worked with a lighted sound buoy to warn navigators.

Coast Guard Checks Structures

The Coast Guard inspects about 14,000 of these private aids to navigation and there are a thousand more of them every year. It issues notices to mariners telling of the structures. It sees that position and signal data are available to charting agencies for inclusion in nautical maps. These maps have to be revised constantly; it is almost impossible for chart makers to keep up with new marine installations.

To ease this problem, the Coast Guard has begun to issue to mariners its own local notices with the latest information. It is urging all navigators to use them. (From article by Tania Long, "The New York Times," April 16, 1967.)

Scientists Warn Against Lake Erie's Increasing Pollution

The growing pollution of Lake Erie must be stopped before it becomes a health hazard and limits the lake's usefulness for industrial purposes, University of Michigan and BCF scientists told a recent meeting of the American Institute of Chemical Engineers. Prof. L. L. Kempe, of the university's department of chemical engineering, and James W. Moffett, director, and John F. Carr, research biologist, of BCF's Biological Laboratory in Ann Arbor, reported that the principal source of pollution comes from the Detroit River and industrial and urban development around the lake.

They said standard sewage treatment methods are inadequate to protect fresh water lakes and streams. Protection must come through the total exclusion of pollutants: wastes must not be dumped into the water, they must be totally distilled, and polluted rivers should be bypassed around the lake.

"Recreational and commercial values of Lake Erie, the world's 12th largest lake, have deteriorated substantially in the past 50 years," and our complex society is "accelerating the decadence of the Great Lakes as we know them."

Sewage systems, industry, and shipping are helping to pollute tributaries and inshore waters and to create an increasingly foul lake bottom.

The Lake's Death Can Be Regulated

The scientists said that "the death of Lake Erie can be regulated, much as we now slow the rusting of steel, the rotting of timbers, or the demise of man himself." Although "changes

in the physical and chemical properties of the water have been relatively mild," they added, the bottom deposits, periodic lack of oxygen, and rapid increase of nutrients have drastically affected plants and animals.

At present, even the best sewage-treatment processes remove only part of the carbonaceous biological oxygen demand; they do little to remove nutrients such as nitrates and phosphates. Complete exclusion of even treated sewage and industrial wastes from surface waters is desirable. This can be done by regulating waste water and permitting its reuse for industrial and domestic water supplies.

Pollution has contributed to an increase in sludge worms and to the elimination of the mayfly, "a clean water insect and a prime source of food to the fishes that inhabit the lake." And this has drastically reduced whitefish and walleye pike and has made blue pike and lake herring "now nothing more than museum pieces."

While noting that current pollution abatement efforts promise direct and immediate benefit, particularly in the tributaries and inshore waters of the Lake Erie basin, the scientists said much more is needed. To save the open waters, research must begin immediately to determine how much pollution Lake Erie can receive without harming the native species of fish and fish-food organisms. Unlike rivers, lakes do not have a great capacity for cleansing themselves. The pollution load entering Lake Erie apparently is being concentrated in the bottom sediments, the major cause of oxygen depletion. New ideas must be developed and used to attack the environmental problems of Lake Erie, particularly those connected with the sediments.

U. S. Commercial Fleet Grows

The U. S. commercial fishing industry added 816 vessels to the fleet in 1966, the highest number since the 1,002 additions of 1949. Nearly half the new vessels--373--list home ports in Gulf Coast states; 202 list Pacific Coast home ports. The vessels range from 20 to 175 feet long.

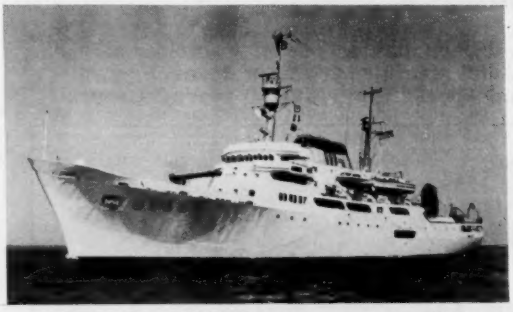
Oceanography

RESEARCH SHIP "DISCOVERER" COMMISSIONED

The USC&GSS Discoverer, America's newest deep sea research ship, was commissioned April 29 at Commodore Point, Jacksonville, Fla. The $10,000,000 "floating laboratory" is the sister ship of the USC&GSS "Oceanographer," which left Jacksonville March 31 on an 8-month, 37,000-mile, global scientific expedition.

The Discoverer joins a fleet of 15 oceanographic and hydrographic survey and wire drag ships of the Coast and Geodetic Survey, U. S. Department of Commerce's Environmental Science Services Administration (ESSA). She will be based on the east coast.

Her keel was laid in 1963 and the ship launched in 1964. The Discoverer and the Oceanographer are the largest and most automated oceanographic research vessels in the U. S. Each vessel boasts an electronic brain capable of performing 100,000 calculations per second. The computer will gather and process enormous amounts of oceanographic data and monitor the ship's automated central engine room control.



Research ship USC&GSS Discoverer. (Photo: ESSA)

Has the Latest Equipment

The Discoverer is equipped with closed-circuit television to assure proper operation of the electronic equipment. The ship has a central well that extends vertically through the vessel. Special experimental equipment can be lowered through it and oceanographers using diving equipment can enter and leave the vessel.

Special bow-viewing ports below the water line will permit underwater observations.

The vessel is strengthened for navigation in ice and has extensive specialized electronic and mechanical equipment for oceanographic, meteorologic, and geophysical observations. Laboratory space of over 4,100 square feet will allow shipboard analysis of collected data and samples. All living and working areas are air conditioned and served by interconnecting communication facilities.

The 303-foot, 3,800-ton Discoverer and her sister ship were constructed as part of a 10-year national oceanographic program to obtain vitally needed knowledge of the seas. The program was developed by the Interagency Committee on Oceanography of the Federal Council for Science and Technology.

* * *

NEW EDITION OF ATLANTIC COAST NAUTICAL BOOK PUBLISHED

The Coast and Geodetic Survey (CGS) has published a new edition of "U.S. Coast Pilot 2," a 230-page nautical book describing a 267-mile stretch of the Atlantic Coast from Cape Cod, Mass., to Sandy Hook, N. J. The last edition of the book was published in 1960. CGS is an agency of the Commerce Department's Environmental Science Services Administration.

CGS publishes 8 Coast Pilots for all U.S. coastal and intracoastal waters. New editions appear every 4 to 10 years. Generally, the books furnish information that cannot be shown graphically on marine charts, e.g., "navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, freshets, routes pilotage, and port facilities." Cumulative supplements contain changes reported since the most recent editions and are published early each year.

Area covered by new edition of U. S. Coast Pilot 2, a 230-page nautical book describing the Atlantic Coast from Cape Cod, Mass., to Sandy Hook, New Jersey.

The first edition of Coast Pilot 2 was published in 1918. The new seventh (1966) edition describes the Port of New York and other deep-water ports at New Bedford, Mass.; Providence, R. I.; New London, New Haven, and Bridgeport, Conn.; and Albany, N. Y. It describes the fishing and recreational waters of Nantucket, Vineyard, Rhode Island, Block Island Long Island Sounds, and the waters off Long Island's south coast.

Cover Other Waters and Ports

The Coast Pilot also covers the waters and ports of Buzzards and Narragansett Bays, Providence River up to Providence, R. I., Thames River up to Norwich, Conn., Connecticut River up to Hartford, Conn., Housatonic River up to Derby and Shelton, Conn., the Hudson River up to Troy, N. Y., and the New Jersey rivers of Passaic, Hackensack, Raritan, Shrewsbury and Navesink.

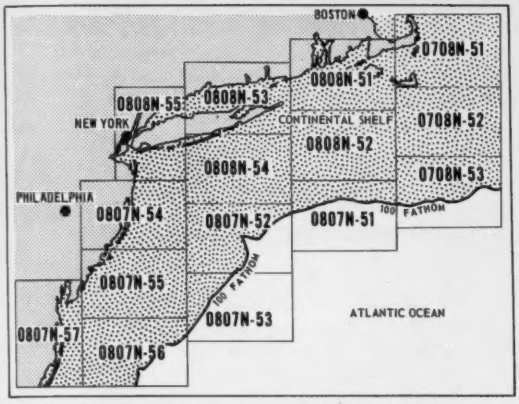
Besides serving the maritime shipping industry, the new edition, coordinated with many of CGS' new small-craft nautical charts, serves the small-boating community.

Copies may be purchased for $2.50 from the Coast and Geodetic Survey (attn. C44), Rockville, Md. 20852, or from Survey sales agents throughout the area. The annual Supplements are free.

* * *

NEW MAPS DEPICT 400-MILE STRETCH OF ATLANTIC SEABED

New maps covering the Atlantic Ocean seabed off a 400-mile stretch of the Massachusetts to Maryland coast have been issued by the Coast and Geodetic Survey of the U. S. Department of Commerce's Environmental Science Services Administration. They depict the mid-Atlantic continental shelf from Cape Cod to Chincoteague Bay--covering an area extending over 100 miles offshore to the shelf's 600-foot edge and beyond, to a depth of 3,000 feet.



Seabed off mid-Atlantic coast covered by 15 new bathymetric maps. Individual maps are identified by number.

The bathymetric maps portray in detail the topography of the seafloor by depth contours at one fathom (six feet) intervals to the 100-fathom curve, and 10-fathom (60 feet) intervals to the 500-fathom curve. Submarine features are emphasized by gradient tints and include Nantucket Shoals; Phelps and Davis Banks; Hudson, Black, Atlantis, Veatch and Hydrographer Canyons; and the approaches to Long Island Sound, New York Harbor, and Delaware Bay.

The maps cover about 40,000 square miles of the Atlantic continental shelf. Produced at a scale of 1:125,000, they represent the most detailed bathymetric coverage ever published of this area's seabed.

Captain Lorne G. Taylor, chief, CGS Marine Chart Division, said the maps will be used by the New England Regional Development Commission and will provide "a foundation for future exploratory efforts and geophysical measurements. Development of the economic potential of the offshore areas is heavily dependent upon maps of this kind. Knowledge of the sea bottom is important for the extension of fisheries, for mineral exploration, for study of shoreline accretion and erosion, and for use in marine engineering."

The maps were produced under a cooperative arrangement between the New England Regional Development Commission, Coast and Geodetic Survey, Interior Department's Bureau of Commercial Fisheries, and Commerce Department's Economic Development Administration.

The series of 15 maps may be purchased for 40 cents each by mail from Coast and Geodetic Survey (Attn. C44), Rockville, Md. 20852; by mail or in person from Coast Survey Chart distribution centers at 121 Customhouse, San Francisco, Calif. 94126, and 602 Federal Office Bldg., 90 Church St., New York City 10007; and in person from Coast and Geodetic Survey, Commerce Building, Room 1127, Washington, D.C. 20230.

Created in 1849, the Department of the Interior--a department of conservation--is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.

Foreign Fishing Off U. S. Coasts, March 1967

IN NORTHWEST ATLANTIC

The surveillance of foreign fishing off the U. S. North Atlantic coast in March 1967 was hampered by poor weather. Only a limited assessment of the situation was possible.

Soviet: The estimated number increased gradually from 35 to 40 vessels early in the month to about 60 by month's end, when additional medium and large side trawlers and support vessels arrived. (During February 1967, 40 vessels were sighted; in March 1966, over 100.)

Soviet fishing generally ranged along the 100-fathom curve of the Continental Shelf from south of Long Island, New York (Hudson Canyon), to south and southeast of the Nantucket Lightship (Hydrographer Canyon). But most fishing was inside ICNAF subarea 5; only a few vessels fished west of ICNAF's western border south of Long Island. Moderate catches of fish on deck appeared to be primarily red hake and whiting, the same species landed in March 1966.

On some large stern factory trawlers, the Soviets have replaced rollers consisting of 30"-diameter steel bobbins with 12"-diameter rubber rollers. An estimated 4 rollers are used for every 6-foot section of the sweep. Three 4"-diameter spacers are attached between each roller. Reducing the size of rollers allows the trawl net to fish considerably closer to the ocean floor--and capture a higher percentage of bottom-dwelling species. These adjustments also will allow the trawl gear to fish effectively on both rough and smooth bottom. This lessens the workload of crews by eliminating frequent changing of gear when bottom conditions suddenly change. Finally, the changes tend to lighten the trawl and could allow the vessel to cover a greater distance during the same towing time.

IN MID-ATLANTIC BIGHT

Soviet: Fishing was discontinued in early June 1966. Soviet vessels were sighted only occasionally, mostly on their way to the newly opened Havana fishing port, and further south into the expanding Soviet fisheries off Argentina. Some limited exploratory research also was done during intervals in the fishing.

At the end of February 1967, the Soviet fleet again reappeared off Virginia, Maryland, Delaware, and New Jersey. Fewer than 10 vessels were sighted; there had been 30 vessels fishing in the area a year earlier. On March 30, 1967, a surveillance flight by U. S. Coast Guard and BCF officers sighted 7 Soviet vessels--5 factory stern trawlers and 2 medium side trawlers. Six vessels were located along the 100-fathom curve from 80 miles east southeast of Cape May, N. J., to 90 miles east of Atlantic City. A single trawler was sighted 25 miles east of Cape Henry, Va. Though all vessels were fishing, no fish was observed on deck. Dehydration plants were operating on several vessels. Reports from Hampton, Va., fishermen indicate the Soviets are taking herring (river herring) and small scup (porgies).

OFF SOUTH ATLANTIC

Japanese: Taiyo Fishing Company's exploratory trawler has found poor fishing for shrimp and bottomfish off the South Atlantic coast. As of early March, catch per day of operation averaged only 5 to 6 metric tons of bottomfish, with very small quantities of shrimp. The vessel is believed operating well beyond the U. S. 12-mile zone.

IN GULF OF MEXICO

No foreign vessels were reported fishing off or near the U. S. Gulf Coast, but several Soviet vessels were sighted on their way south (to Havana port and then to southwest Atlantic) through the Florida Straits.

OFF CALIFORNIA

Soviet: From 1 to 6 vessels were sighted fishing off the California coast during March, indicating fishing is still only exploratory. Most were sighted off the San Francisco area, and some were passing through on their way south to fishing grounds off Mexico.

On March 31, 1967, the U. S. Coast Guard and California Department of Fish and Game identified 6 Soviet vessels 22 miles southwest off Half Moon Bay (San Mateo County near San Francisco) as 5 medium side trawlers and a 3,600 gross-ton refrigerated transport (the "Gutsul", recently constructed in Poland). The trawlers were fishing in 100-130 fathoms; the catch appeared to be rockfish. This was the same area the Soviets explored at end of January.

Fig. 1 - The refrigerated fish carrier Gutsul (3,600 gross tons) was providing support to 6 Soviet medium trawlers fishing off California's Half Moon Bay in early April 1967.

OFF PACIFIC NORTHWEST

Soviet: During March, there were about 10 Soviet fishing and support vessels off the coast of Oregon. They remained for a week, then most headed north. By month's end, only 4 vessels remained off Oregon. No vessels were sighted off Washington.

The vessels were catching hake, true cod, ocean perch, and other rockfish. The catches observed consisted primarily of hake and true cod. The largest amount was about 20 metric tons taken in one drag by a stern trawler, consisting primarily of true cod with some ocean perch.

During the month, several research vessels continued to explore the resources off both Oregon and Washington. The "Ogon" was sighted fishing on March 3, about 70 miles northwest of Cape Flattery (Washington) in 200 fathoms. By month's end, the Ogon was exploring about 30 miles off Cape Arago (Oregon). Other Soviet research and exploratory vessels were sighted mainly off Oregon.

Japanese: In March, the Japanese had up to 4 stern trawlers off Washington and Oregon catching ocean perch primarily. The perch were cleaned and frozen in 60-pound packages. The viscera were reduced to meal and oil aboard the vessels.

The captain of the "Taiyo Maru" said in an interview that the total fish catch did not warrant licensing more Japanese vessels to fish off the U. S. Pacific Northwest. As of March, 3 stern trawlers, each accompanied by a side trawler, were licensed to fish in that area.

OFF ALASKA

Japanese: The number of Japanese vessels fishing off Alaska increased from about 36 to over 90 during March. Most of the increase was in eastern Bering Sea pollock and king crab fisheries.

Pacific ocean perch fishing in the Gulf of Alaska was concentrated on the Yakutat grounds and on Albatross Bank throughout the month. The factory trawler "Kokuyo Maru" fished in Yakutat in early March, shifted briefly to Albatross Bank, and then presumably returned to Japan. The factory trawler "Kirishima Maru" fished for perch in Yakutat during second half of March. Perch fishing on Albatross Bank was conducted throughout the month by the factory trawlers "Daishin Maru No. 12" and "Yutaka Maru." The factory trawler "Ryuyo Maru" departed Albatross Bank in early March and returned to Japan. The factory trawlers "Akebono Maru No. 72" and "Aso Maru" and another trawler were fishing for perch along the 100-fathom curve south of the Pribilof Islands in late March.

The factoryship fleets in the Alaska pollock fishery north of the Fox Islands in the eastern Aleutians increased from 2 to 4 during March. Active at month's end were the factoryships "Soyo Maru," "Chichibu Maru," "Shikishima Maru," and "Gyokuei Maru." Those vessels are licensed to be accompanied by 62 trawlers. Independent trawlers also active included the "Zuiyo Maru No. 2," "Akebono Maru No. 52," "Inase Maru No. 5," and the "Tenyo Maru No. 3." The Tenyo Maru No. 3 returned to Japan at month's end.

The Japanese eastern Bering Sea king crab fishery started in early March. The vessels were the factoryships "Keiko Maru" and "Tainichi Maru," each accompanied by 5 net-setting trawlers.

Sablefish operations were conducted by the long-line vessel "Kotoshiro Maru No. 25" off Chirikof Island in early March. One long-liner off Cape St. Elias, and one off Southeastern Alaska, were reported in late March.

Soviet: Fishing and support vessels off Alaska increased from about 130 in early

March to over 150 by month's end. The number was about the same as in March 1966.

During the month, a significant shift occurred in the Soviet eastern Bering Sea flounder fishery; most of the effort, over 70 vessels in early March, was switched to Gulf of Alaska ocean perch fishing.

In the Bering Sea flounder fishery, the catch rates had dropped off sharply as the large schools of fish began to disperse. Early in the month, several vessels were detached and sent to Gulf of Alaska to explore for Pacific ocean perch. Because ocean perch were located, some flounder-fishing vessels moved into the Gulf. Decreasing flounder catches in early March in the Bering Sea prompted a large exploratory effort. Many vessels were temporarily assigned to exploration and soon found new resources. As a result, the flounder fleet in the Eastern Bering Sea increased somewhat by mid-March; catches were moderate to good. But the rally was short-lived. By month's end, it appeared the flounder season was about finished. Only about 30 vessels remained.

The Gulf of Alaska ocean perch fishery effort doubled during March as more fishing and support vessels entered the area--some from the Bering Sea flounder fishery and some new arrivals from Siberian ports. The main perch fishing areas were on Portlock Banks (east of Kodiak Island), near the Yakutat Bay in the Central Gulf, and off Southeastern Alaska. Early in March, 30 fishing trawlers and 4 support vessels fished for perch on Yakutat grounds. By mid-March, that group broke up and fishing operations were switched west to Portlock Bank and southeast below Chichagof Island.

Portlock Bank was fished for only a short time; by month's end, all vessels returned to Yakutat grounds, further southeast along Alaska's and Canada's coasts, or returned home.

In mid-month, about 15 trawlers were perch fishing off southeastern Alaska (from Chichagof Island to Canadian border). At end of March, about 25 trawlers, joined by 5 processing and support vessels, were there.

The continuous shifting from area to area indicates extensive exploration was conducted on the by-now traditional Soviet ocean perch grounds in Gulf of Alaska and adjacent areas. As perch schools were found, the fleets followed the scouting vessels. Despite some success, the size of perch schools reportedly was small both in the Gulf and along Aleutians. It is not impossible that the abundance of virgin perch stocks fished by Soviets since 1962 has decreased considerably. In 1966, only about 250,000 metric tons of Pacific ocean perch were caught off U. S. coasts by Soviets, compared to 392,000 tons landed in 1965.

Only a few vessels fished for perch along tip of Alaska Peninsula, and along Aleutian Islands. Their number increased to 6 fishing trawlers and 1 refrigerated transport by end of March.

Shrimp fishing on Continental Shelf near Shumagin Islands continued with 20 medium freezer trawlers serviced by floating cannery "Vasilii Putintsev." Shrimp were unusually abundant and, by end of February, the Soviets processed over 5,000 metric tons of small Pacific shrimp. Since shrimp are more abundant closer to shore, vessels were fishing inside newly established 12-mile fishery zone until U. S. Coast Guard seized 2 shrimp vessels, both fined in U. S. courts. Soon afterwards, many shrimpers left Shumagin area and continued operations off Afognak Island (adjacent to Kodiak Island). By end of March, 15 medium trawlers, one canning factoryship, and one refrigerated transport were sighted off Afognak; only 5 trawlers still remained on Shumagin shrimp grounds.

The king crab fishery in eastern Bering Sea began in first week of March, when one floating cannery accompanied by 3 net-setting medium trawlers arrived from Vladivostok. Soon 2 more sisterships arrived, also with net-setting trawlers. As in 1966, it is believed the 1967 effort will not exceed 3 canning factoryships, 9 medium trawlers, and 33 pick-up boats. But unlike 1966, the Soviets began somewhat earlier this year.

The king crabbing is regulated by U. S.-USSR agreement. In 1966, Soviet vessels in eastern Bering Sea caught 2.6 million adult male crabs and produced 104,700 cases (48 ½-lb. cans) of canned crab meat--only 88 percent of agreed yearly quota of 118,600 cases. During February 1967 negotiations, it was agreed that the 1967 Soviet pack should be 15 percent less, or 100,000 cases. It is believed the Soviets will try their best to achieve the agreed-on quota.

SOVIET FISHING VESSELS SEIZED

During a fishery patrol on March 2, 1967, the U. S. Coast Guard cutter "Storis" observed Soviet medium freezer trawler "SRTM-8413" fishing close to U. S. shore off southern Alaska Peninsula (158°56' W. and 55°50' N., or about 1.3 miles off Mitrofania Island, northwest of Shumagin Islands). The Storis ordered the vessel to stop for boarding, but captain attempted to leave area. While steaming full speed towards international waters, the vessel dropped its trawl and also dumped unspecified material overboard. Overtaken 13 miles off U.S. coast, the SRTM finally stopped and allowed an armed Coast Guard party to board her. The Soviet captain was told that he had broken U. S. law and the vessel would be escorted into the Sand Point Coast Guard Base. On March 3, at 2 a.m. Alaska time, the SRTM-8413 began to steam towards Sand Point, escorted by the Storis. In about 2 hours, however, the Soviet mothership "Vasilii Putintsev," which was servicing the shrimp-fishing trawlers and is flagship of the Commander of the Soviet Pacific Shrimp Expedition, Vasilii Guzenko, intercepted the convoy. The Soviet Commander requested and was granted 2 conferences with Comdr. George Hardy Jr., Commanding Officer of the Storis, to review the situation and to delay departure of SRTM-8413 until the Far Eastern Administration at Vladivostok would permit Guzenko to accompany the captain into Sand Point. It took 14 hours to obtain permission and board the trawler guarded by the Coast Guard prize crew.

Early on March 5, the two Soviets were flown by Coast Guard to Kodiak, where the Soviet captain was arraigned before a U. S. Commissioner and charged with violating U. S. fishery and territorial laws. Awaiting the party there was an official of the Soviet Embassy in Washington and a court-appointed attorney.

The SRTM-8413 and its crew were released the same day, and the vessel proceeded out beyond the U. S. 12-mile zone. On March 6, the trial took place at Anchorage and the Soviet Captain was fined US$5,000. He pleaded nolo contendere (not admitting guilt but not contesting the evidence, thus subjecting himself to conviction as though admitting guilt). The maximum sentence that could be imposed (once vessel was released) was a fine of $10,000 and a one-year prison sentence. This was the first time the U. S. had seized a Soviet fishing vessel and prosecuted its captain for violation of territorial waters.

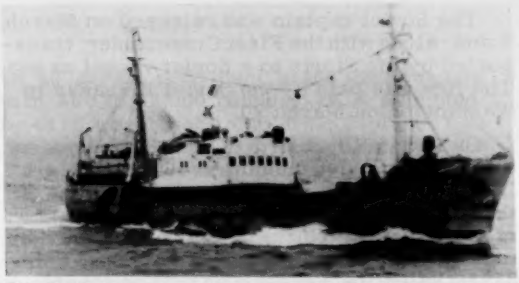


Fig. 2 - Soviet medium freezer trawler SRTM-8413 apprehended by U. S. Coast Guard fishing inside U. S. territorial waters. Answering signals of the U. S. Coast Guard cutter Storis. (Photos: U. S. Coast Guard)

Fig. 3 - A crewman of Soviet trawler SRTM-8413 uncovers a catch of Pacific shrimp caught off U. S. coast.

Fig. 4 - Spoiled shrimp aboard Soviet trawler are washed back into the sea.

The Soviet captain was released on March 7 and, along with the Fleet Commander, transported by the Storis to a Soviet vessel at sea. The fine was paid by the Soviet Embassy in Washington on March 20.

On March 10, a U. S. Coast Guard patrol observed 3 Soviet medium freezer trawlers inside the 9-mile contiguous fishery zone off the Shumagin Islands (Alaska). One was 3.5 miles offshore. Of the 3, only 1 trawler fishing for shrimp was identified as the SRTM-8421 "Valentina Tereshkova." The others were also probably catching shrimp.

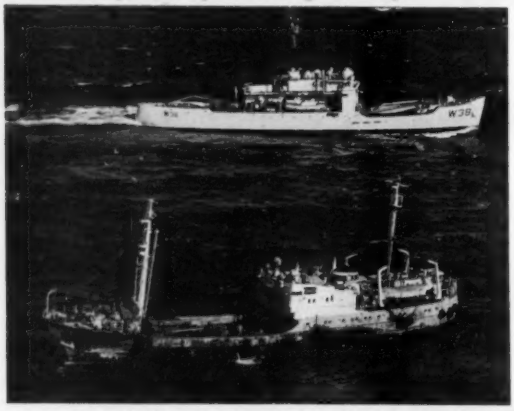


Fig. 5 - Twice in less than 3 weeks, crew of U. S. Coast Guard cutter Storis (W 38) stopped and boarded a Soviet shrimp trawler violating U. S. fishery laws off Alaska. Storis is shown preparing to lower boat with boarding party. The medium freezer trawler SRTM-8457 (foreground), is watched by a Coast Guard aircraft, from which photo was taken.

On March 22, a Coast Guard aircraft sighted a Soviet fishing vessel 5.5 miles east of Seal Cape (Alaska) and identified it as "SRTM-8457." The vessel had nets in the water and thus was fishing well within the 9-mile contiguous fishery zone. The aircraft signaled the vessel by radio, flashing lights, and message block to stop, but the vessel hauled in her nets and departed. The aircraft maintained "hot pursuit" and contacted the nearby cutter Storis. Her personnel boarded the vessel 15 miles from the U. S. coast. The Soviet captain admitted fishing when first sighted but believed he was out more than 12 miles. A prize crew was placed aboard the vessel, but the captain (supported by the Fleet Commander) protested the seizure and stated the vessel would not proceed to a U. S. port under her own power. The 700-gross-ton medium freezer trawler had to be towed by the Storis for 48 hours before arriving at St. Paul Harbor, Kodiak.

Fig. 6 - A small U. S. Coast Guard plane hovers over Soviet medium freezer trawler SRTM-8457 as it takes aboard a load of shrimp only 6 miles off U. S. Alaskan coast. The trawl bag containing shrimp (middle left) was pulled aboard, but wings of the trawl and headline floats (upper middle) are still alongside vessel.

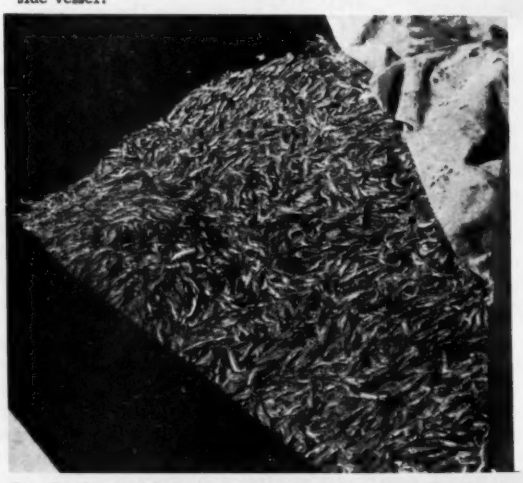


Fig. 7 - Some of fresh shrimp found aboard SRTM-8457 after seizure by Coast Guard.

The Soviet captain was tried in the Anchorage District Court and given a $10,000 fine to be paid immediately. Unable to pay, he was held overnight, until Iruii Chemokhud of the USSR Embassy in Washington paid the fine. The captain was released and transported to his vessel. The Soviet diplomat stated that the Soviet Government respects its international obligations and that the captain would lose his master's license for one year and would have to repay the fine to the Soviet Government.

STATES

Alaska

HIGHLIGHTS OF 1966

BCF Juneau reports:

- Alaska remains the number 1 fishery state with landings valued at $74 million and products worth about $200 million--25 percent greater than California's, the number 2 state.

- Kodiak (population 3,500) is the Nation's third most important fishery port with landings worth $13 million--$3 million more than Boston.

- Fish eggs cured in Claska during 1966 were worth $4 million, or about 25 percent of the wholesale value of products from the U. S. Pacific halibut fishery. Salmon roe amounted to $3 million; herring roe $350,000; cured kelp with herring eggs (harvested during a 45-minute season) $600,000.

- The value of the herring roe and kelp products matched the wholesale value of meal and oil produced in Washington State (from hake and other species). It was nearly twice the value of meal and oil produced in either Oregon or in the Lake Michigan alewife fishery.

- Alaska salmon egg and herring egg products are exported to Japan and represent about 6 percent of U. S. fishery exports.

- The salmon catch was 352 million pounds, the best since 1949.

- King crab continued as Alaska's second most important fishery--landings hit a record 159 million pounds. Products of this fishery were worth $38 million, three times the value for products of the U. S. Pacific halibut fishery.

Arkansas

BCF AIDS IN HARVESTING CATFISH

During the first 3 months of 1967, BCF gear specialists harvested 108,000 pounds of catfish from Arkansas farm ponds for demonstration purposes. The ponds ranged from 5 to 40 acres, individual seine hauls caught from 600 to 42,000 pounds. BCF designed live-cars were used to hold the captured fish in good condition for 1 or 2 days.

In the 40-acre pond, 87 percent (63,000 pounds) were caught in 2 hauls. In a 10-acre pond, 89 percent (18,300 pounds) were taken in 2 hauls. The results were poor only in ponds containing snags, such as roots or stumps, or in ponds with undesirable design features.

Commercial pond-fish production is expected to grow this year.

California

DIVIDED 1966 ALBACORE LANDINGS WITH OREGON

The March report of the Resources Agency of California states that preliminary albacore landing figures show Oregon and California divided the 1966 commercial landings almost equally--California 18.2 million pounds, Oregon 18.0 million. It was the best season since 1944 for Oregon, the worst since 1947 for California. Washington landings totaled 1.1 million pounds.

The report discloses that Northern California crab fishermen are enjoying a very good year. Over 8 million pounds of high quality crabs have been landed. Good catches are predicted for another month or two. In the San Francisco area, however, the season's catch will be low, a little over 300,000 pounds. These are the grounds that historically produced 3 to 4 million pounds per season.

* * *

TROUT FLOWN TO MOUNTAIN LAKES

Over seven million of California's trout and kokanee salmon fingerlings took to the air in 1966, reports the California Department of Fish and Game (DFG). They were planted in high mountain lakes by DFG's warden-pilots flying twin-engined Beechcraft airplane.

DFG has been air planting more than 800 lakes annually since 1946 with 6 to 7 million fingerlings. They are planted in hard to reach places, where natural reproduction is inadequate to sustain angling pressure. This modern method of planting is a fraction of the old horseback method's expense and stocks scores of lakes never before planted.

Air Dropped Safely

Fingerling trout, less than an ounce per fish, have been air dropped safely from as high as 800 feet, but the average free fall drop is about 250 feet.

DFG pilots logged 155 hours on 104 flights to plant 819 lakes in 1966. Planting is done in the summer, as soon as the ice melts. Some fingerlings reach catchable size in a year; some take 2 years.

The 1966 plants were: 1,754,145 rainbow trout, 614,132 eastern brook, 4,152,842 kokanee, 75,305 browns, 249,340 Lahonton cutthroat, and 304,400 golden trout.

Maine

U. S. AGENCY ASKS PENOBSCOT BAY AREA TO CUT POLLUTION

The Federal Water Pollution Control Administration (FWPCA) told the Penobscot Bay area of Maine on April 20 in Belfast, Me., to reduce the pollution of shellfish beds by 1970 or face Government penalties. Last year, Senator Edmund S. Muskie of Maine introduced amendments to the Federal Water Pollution Control Act that empower Interior Department to initiate action when substantial economic injury is involved in navigable waters.

Secretary of the Interior Stewart L. Udall called the Conference of Maine and FWPCA officials in Belfast because he found that the discharge of wastes from industries and communities into the bay area have damaged clams and prevented their sale in interstate commerce. FWPCA is Interior's enforcement agency, backed by the Department of Justice.

Penobscot Bay shore (cross).

Maine Closes Valuable Shellfish Beds

A FWPCA report states that pollution impelled the State of Maine to close shellfish beds near Northport, Belfast, Searsport, Stockton Spring, Penobscot, and Castine. These waters have an estimated 96,000 bushels of soft shell clams worth $2-$5 million. Because of water pollution, the last shellfish beds in upper Penobscot Bay were closed last June by Ronald W. Green, State Commissioner of Sea and Shore Fisheries. The bay once was a major source of lobsters and clams.

FWPCA listed Bangor and Brewer as the leading offenders and pinpointed municipal sewage as responsible for 65 percent of the pollution. Its report said bacterial pollution is caused primarily by the sewage. FWPCA listed 2 poultry plants in Belfast as contributing 11 percent of pollution, and industries and municipalities 24 percent. Wastes from pulp and paper companies kill fish, cause offensive odors and discolor waters.

Penobscot Bay stretches seaward 35 miles from the mouth of Penobscot River, one of Maine's 3 major industrial streams; Kennebec and Androscoggin are the others.

Michigan

RELEASES 3 MILLION SALMON
IN GREAT LAKES

About 850,000 young chinook or king salmon and 2.2 million coho (silver) salmon were released by Michigan's Department of Conservation during April and May into several Michigan tributaries of Lake Michigan and one site on Lake Superior.

The chinook plantings were the first for the Great Lakes. Hopes are high that they will be as successful as the coho planting of last spring. The rivers selected for the chinook were: Muskegon and Little Manistee on Lake Michigan, and Big Huron, near Keweenaw Bay, on Lake Superior. When released, the chinook were 3-4 inches long. If they thrive as well as the cohos, they should grow to the 15-40 pound class within their 3-5 year life cycle. About a million chinook eggs were donated by Washington State.

The Department of Conservation planned to release over 2.2 million yearling coho salmon (4-6 inches) in five streams in late April. The outlook for their development is very bright based on the results of last year's initial plantings of 850,000 fish in three streams. An estimated 2,000 cohos were caught last fall. They averaged about three pounds, but one two-foot fish weighed over seven pounds. During the first run last fall, enough egg-bearing females were caught so that state hatcheries now have 22,000 "Great Lakes" coho salmon in the sac-fry stage. The adult coho is smaller than the chinook; those on the West Coast generally are 6 to 12 pounds.

A natural food for both species is the alewife, also normally an ocean fish. The alewife adapted readily to fresh water. Its population currently is exploding in the Great Lakes. Preliminary 1966 alewife catch figures indicated a Lake Michigan total of about 29 million pounds. If the coho and chinook become established in Lake Michigan, the alewife numbers should be reduced substantially. Perhaps then the balance that existed before the lake trout (also an alewife feeder) was virtually eliminated in Lake Michigan by the parasitic sea lamprey would be approached.

North Carolina

BCF'S "OREGON"
AGAIN LOCATES SCALLOP BEDS

In recent months, 10 to 12 boats were landing 5,000 to 6,000 bushels daily from the very productive calico scallop fishery conducted off Morehead City, North Carolina. But in recent weeks the catch dropped to where it was becoming unprofitable to fish. The industry asked BCF to help. The Bureau's exploratory vessel Oregon was sent to work with industry boats in surveying areas at the edges of the beds previously fished.

The survey results were good, and again several commercial vessels are each landing daily 500 to 600 bushels.

The calico scallop resources, which extend from Morhead City to southern Florida, were first outlined through BCF explorations.

Washington

SHIPYARDS ARE BUSY

Shipyards in Tacoma, Seattle, and Blaine, Washington, are filled with the characteristic sounds of shipbuilding. There is enough construction planned to keep their workers busy through 1967. At Tacoma, 6 large tuna seiners are being built. Several smaller ships are being constructed for use in the king crab and purse seine fisheries. Seattle's Pacific Fisherman Shipyard is finishing off the 91-foot Alaska king crabber. Blaine's Berg Shipyard is working on 3 vessels.

The construction under way will add 18 large new vessels to the West Coast fisheries by the end of 1967.

* * *

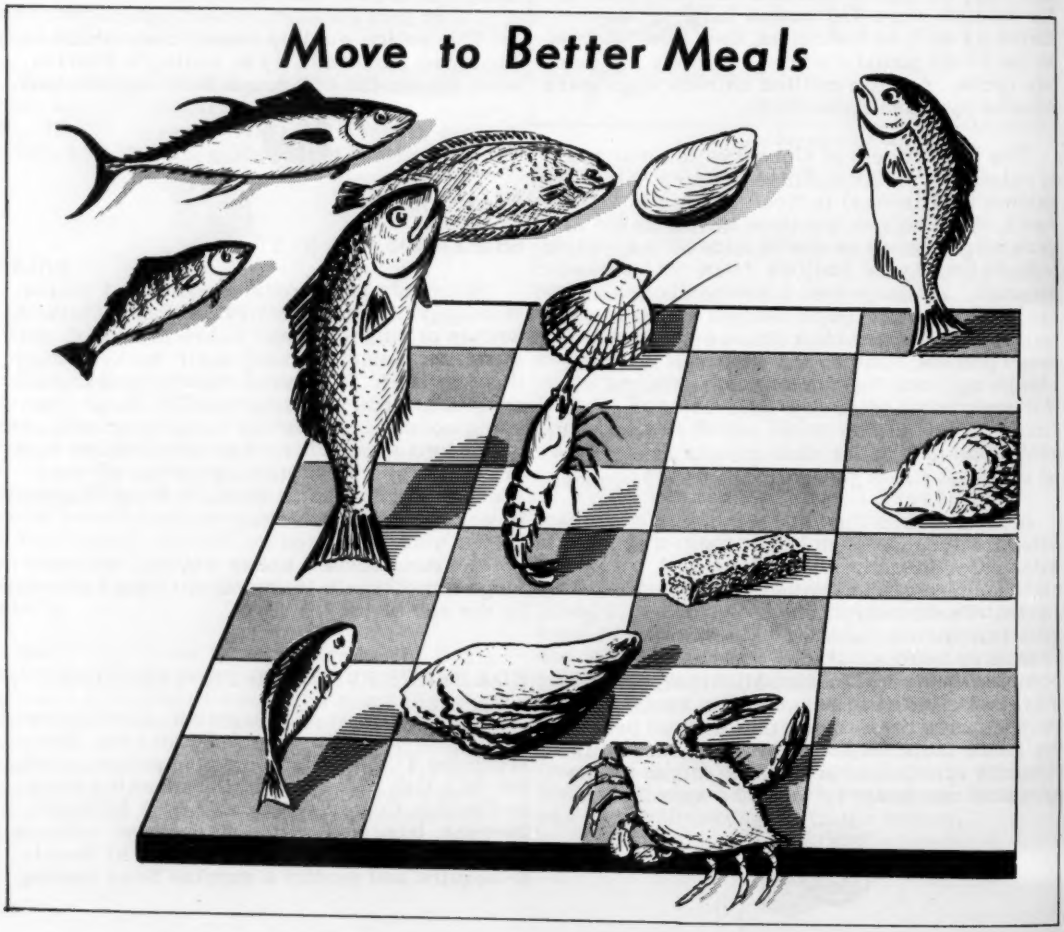
EDA HELPS FUND FISH PROTEIN PLANT

The Economic Development Administration, U. S. Department of Commerce, has approved $791,000 in loans and grants to help set up a fish protein and oil extraction plant in Clallam County, Washington. A $650,000, 20-year, business loan at $4\frac{5}{8}$ percent interest was made to the Cape Flattery Co. of Seattle to acquire and modify a surplus Navy landing

ship, buy machinery and equipment, and erect building and storage facilities.

A $70,500 EDA public works grant and a $70,500 public works loan (20 years at 4⅛ percent interest) also were made to the Makah Indian Tribe to repair and enlarge a pier at Neah Bay. The pier and adjacent land belong to the Tribe. The pier will serve the Tribe's fishing fleet, other fishermen, charter boats, and the Cape Flattery Co.'s "floating plant."

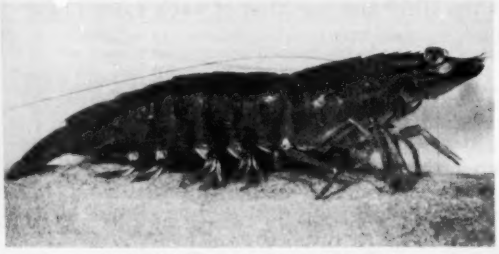
The project also will include an access road and water line to the new plant for fire protection. Total plant cost will be $1 million: $650,000 EDA loan, $50,000 Tribe investment, $100,000 equity capital by Cape Flattery Co., and $200,000 private capital. The plant will convert scrap fish into protein meal and oil. Twenty-four people will be employed and 8 to 10 fishing vessels will be required to supply the raw material when the plant is fully operational. Job priority will be given to Makah tribesmen. EDA also is guaranteeing 90 percent of a $150,000 working capital loan for the Cape Flattery Co.



BUREAU OF COMMERCIAL FISHERIES PROGRAMS

Photograph Pink Shrimp Reaction to Electricity

The "R/V George M. Bowers" returned to Pascagoula, Mississippi, on April 4 from a 21-day cruise (#76) to the Eleuthera Island area, Great Bahama Bank, to study shrimp behavior. The objective was to record with color motion picture film the escape reactions of pink shrimp stimulated by electrodes of the BCF-developed electro-shrimp trawl. Previous attempts to film their behavior patterns in front of the electric trawl on commercial shrimp grounds were unsuccessful because of poor visibility due to high turbidity. The offshore waters off Eleuthera were selected because of water clarity and the similarity between its bottom type and that of commercial shrimp grounds off south Florida.



Adult pink shrimp (Penaeus duorarum).

Live shrimp were transported in circulating seawater tanks on board the vessel to the work area. The shrimp were then placed in bottomless cages, which allowed the animals to burrow into the coralline-sand substrata. After the shrimp burrowed, the cages were removed and the electro-trawl was towed over the area. SCUBA divers riding a sled positioned above the electric trawl and towed by the Bowers recorded the escape reactions of the electrically stimulated shrimp with a 16 mm. movie camera. They obtained 2,000 feet of film sequences.

Burrowed Shrimp Can Be Caught

Shrimp escape reactions appeared to be similar to previous behavior observations collected on Bowers Cruises 59, 60, and 61. The shrimp escaped from the bottom between the first and second electrode of the five-electrode trawl. They jumped several inches above the bottom and exhibited lateral escape reactions. It appeared that such escape behavior would cause burrowed shrimp to be caught as long as the footrope tended bottom.

It also was observed that the electrodes of the electro-shrimp trawl forced large numbers of Portunid crabs out of the substrata and into the trawl.

"Delaware" Locates Yellowfin Tuna

BCF's research vessel M/V Delaware located and fished concentrations of prime-size yellowfin tuna in the Gulf Stream area of the Northwestern Atlantic during 3 weeks of longline fishing explorations (Cruise 67-2, March 10-April 5, 1967). The U. S. Naval Oceanographic Office lent technical and tactical support to determine optimum thermal environment conditions for experimental fishing (see Fig. 3). Previous investigations in this area noted good yellowfin tuna catches after mid-April; results of cruise 67-2 extend the seasonal abundance potential of the species by one month.

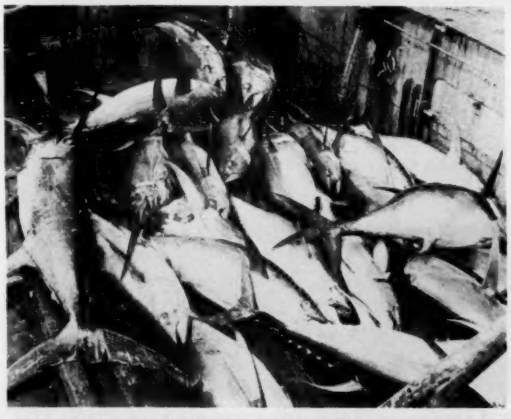


Fig. 1 - Yellowfin, bluefin tuna and swordfish on deck of M/V Delaware were part of a 2-ton exploratory longline catch, March 15, 1967.

Major objectives of the cruise: (1) locate tuna and swordfish concentrations based on analysis of the thermal environment structure, (2) survey seasonal distribution and abundance of tunas and swordfish in Northwestern Atlantic, (3) demonstrate availability of bluefin tuna concentrations to commercial-type longline operations, (4) evaluate applica-

tion of an expendable bathythermograph (XBT) system to obtain layer depth data for fisheries and environmental research, and (5) field test an experimental longline branchline detaching system.

Gear Used: Fishing gear consisted of 165-fathom units of longline with 10 branchlines attached at 15-fathom intervals. Each 10-hook unit was buoyed from the surface with a 5-fathom line. Squid and herring baits were alternately used on every other unit.

Experimental "auto-clips" replaced spring-type clips used to attach branchlines to the mainline. They were automatically released by a prototype detaching device at the rail (see Fig. 2). Adjunct equipment included a marine radiofacsimile recorder, an XBT system, and 2 surface-temperature recording systems.

Fig. 2 - Experimental "auto-clips" connecting branchlines to the mainline were released by a prototype detaching device. When unattended, the detached clips were caught by the semicircular steel rake shown below the detaching mechanism.

Methods of Operation: The approximate geographic position of each fishing station was selected from analyses of synoptic sea-surface temperature and sonic-layer depth charts received daily from Fleet Weather Facility, Norfolk, Virginia, via radiofacsimile. Additional synoptic sea-surface temperature data were received from special radiofacsimile charts of ASWEPS (Antisubmarine Warfare Environmental Prediction Systems) aircraft overflights in the operations area (see Fig. 3). The aircraft used infrared radiation measurement equipment to obtain surface temperature readings for determining positions of strong horizontal gradients. The validity of these data was checked--and the exact position of each station was determined--by analyses of actual sea-surface temperature observations (recording thermographs) and subsurface temperature profiles (XBTs) taken as the vessel moved through the selected area. With the exception of one station (day set at Station 3), longline gear was set after midnight and hauled after sunrise to permit fishing during dark and light hours of the day. The effect of current on the gear (drift) was measured by plots of Loran bearings on the ends of the longline set at time of setout and haulback. XBT recordings of the subsurface temperature profile were taken at the time and position of each Loran bearing.

Results: An abundance of 82-pound average size yellowfin tuna (Thunnus albacares) was found at all but one station. (Station 1: 36°36' N. Lat., 72°07' W. Long.) Catch rates ranged from 1.5 to 5.5 fish per 100 hooks. Best catches were associated with surface temperatures from 69°-73° F. over a well-defined thermocline starting at depths of 15 to 30 fathoms. In these cases, Stations 2 (36°56' N. Lat., 70°44' W. Long.) and 5 (37°44' N. Lat., 69°11' W. Long.), the gear was positioned on the warm side of the north wall of the Gulf Stream in very swift current (set No. 2 drifted northeast at 4.1 knots, and set No. 3 drifted east at 4.2 knots). Similar size yellowfin have been found in this area in abundance as early as mid-April. A year ago, mid-March 1966, a few 35-pound average fish were taken in this area under similar environmental conditions. Catches from this recent cruise, however, mark the earliest known availability of yellowfin tuna abundance in the Northwestern Atlantic.

No concentrations of bluefin tuna (Thunnus thynnus) were located, nor was a thermal environment encountered similar to that which yielded heavy catches a year ago. The scattered catch of 8 bluefin consisted of 327-pound average fish, 50 pounds heavier than the average size in this area a year ago. It is further indication that this group of fish has frequented the region in the late winter and early spring season for 4 consecutive years.

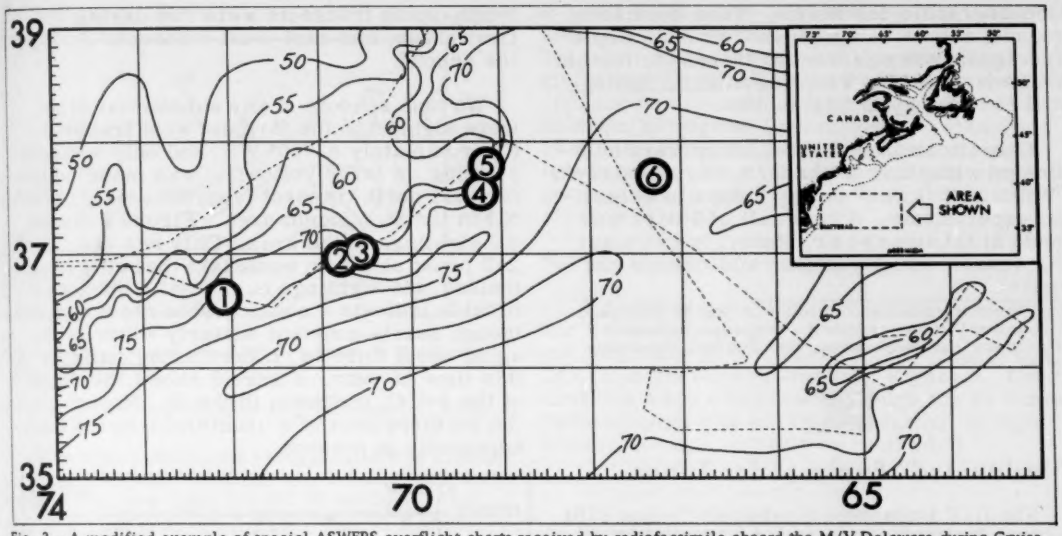


Fig. 3 - A modified example of special ASWEPS overflight charts received by radiofacsimile aboard the M/V Delaware during Cruise 67-2. Sea surface temperatures (Fahrenheit) on this chart are primarily interpreted from infrared radiation readings during the flight of March 28, 1967 (track shown by dashed line). Starting position of the Delaware's six longline stations are numbered. Observed temperatures from the vessel on March 28 and 29 (Stations 3 and 4) agree closely with the aircraft data.

Bigeye tuna (Thunnus obesus) were found at 3 stations and were associated with the same environmental structures as yellowfin tuna. Average weight of bigeye taken at Stations 2 and 5 (see positions on preceding page) was 109 pounds. A single, small, bigeye weighing 20 pounds was taken at Station 6(37°40' N. Lat., 67°20' W. Long.). The only albacore (Thunnus alalunga) caught during the cruise was found at Station 4 (37°34' N. Lat., 69°13' W. Long.) and weighed 52 pounds.

Catches of swordfish (Xiphias gladius) were minimal in the environment fished. The 2 stations of capture also had the highest catches of yellowfin tuna. With the exception of one 210-pound male at Station 2, all swordfish were under 100 pounds.

Heavy shark catches were encountered at 4 stations. Shark mutilation to tunas and swordfish was not significant, although 100 hooks and considerable time were lost due to frequent snarls and parting of gear.

New Expendable XBT Tested

A newly installed expendable bathythermograph system (XBT) was tested to obtain rapid and accurate profiles of vertical thermal structure. Disregarding 3 human errors, 98.8 percent of 85 XBT operations were successful. Immediate availability of vertical temperature data from this system, combined with surface temperature data from radiofacsimile charts and recording thermographs, facilitated maneuvers of the vessel into desired thermal environments for successful fishing. Sixty-two XBTs were coded into BATHY messages and transmitted to ASWEPS on shore.

Full-scale field trials were conducted using experimental branchline "auto-clips" and a prototype rail detaching device. With very few exceptions, the only problems encountered were from branchlines snarled on the mainline. Manual operation of the clips in these cases cleared the gear as quickly as had been accomplished in previous operations. The chief advantage of the system, noted from these trials, was the continuous hauling speed attained, and the consequent easing of ship handling in high winds and moderate to rough seas.

In cooperation with other agencies, 43 tunas and 149 sharks were marked and released using dart tags. Studies on metabolic rates and heat conservation systems in live yellowfin and bigeye tunas were carried out by cooperating scientists from the Woods Hole

Oceanographic Institution. Tuna stomachs, gonads, tissue samples, and several whole specimens were preserved frozen for further analysis at BCF's Tropical Atlantic Biological Laboratory in Miami, Fla.

Operations from the Delaware were coordinated with those of the U. S. Navy Destroyer "William C. Lawe" during 5 days of acoustical experiments. A port call of 5 days was made at Gloucester, Mass., to rebunker the vessel, effect repairs, and change personnel.

Note: For further information, contact Dr. John R. Thompson, Acting Base Director, or Ernest D. McRae Jr., Exploratory Fishing and Gear Research Base, State Fish Pier, Gloucester, Mass., 01930.

"Undaunted" Explores for Tunas

The R/V Undaunted conducted Cruise 6701 through the Southern Lesser Antilles (St. Vincent area), north coast of Venezuela, southern Bahamas, Feb. 2-Mar. 7.

Its primary missions were to investigate distribution and biology of surface tunas and other pelagic predators and measure physical and biological environment--and to investigate distribution and biology of fishes suitable for use as live bait for tuna fishing. A secondary mission was to investigate physical oceanography of the area on the Atlantic side of the Antillean Arc from Martinique to Grenada.

The scientists conducted a fishery-oceanography survey with scouting for tunas during daylight hours in the St. Vincent Island area February 12-28. It was interrupted by a stop to make bait February 18-19, and a physical oceanography survey outside the Antilles Arc February 19-February 23. North-south transects were run during the first phase, and east-west transects during the second.

No tuna schools of any substantial size were sighted on the farthest west transect (approximately 63°30' W.), and only a single sighting of large yellowfin was made on the farthest north transect (approximately 13°00' N.) in the St. Vincent area. Figure 1 shows all sightings in the area. Only one school, of 2-3 pound skipjack, would take the bait. Nonetheless, the sightings numbered 4 through 9 in table indicate a considerable resource, although nearly constant easterly winds, averaging about Force 4, make fishing difficult at this time of year. Figure 2 shows the depth of the 24° C. isotherm in the St. Vincent area; the northern part of a counterclockwise eddy apparently is present.

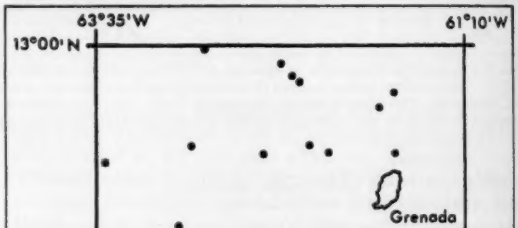


Fig. 1 - Tuna sightings in St. Vincent area.

Several sightings of tuna schools in the southern Bahama Islands and northwest of Mona Passage (Table, Nos. 1-3 and 10) suggest a resource at this season. These sightings were made while steaming and were not part of an organized survey. On the basis of sightings Nos. 2 and 3, a short fishery-oceanography survey was run between Caicos Bank and Great Inagua Island (March 3-5) but no sightings were made.

Sightings of Substantial Schools (Estimated at 5 Tons or More) of Tuna, UN 6701.

No.	Position (N. Lat.)	Position (W. Long.)	Date	Time (GMT)	Species	Estimated No. Tons	Remarks
1.	24-17	75-11	Feb. 4	2100	Yellowfin+blackfin	10-15	2 blackfin on jig1/
2.	21-21	72-33	Feb. 5	1845	Yellowfin+skipjack	4-5	1 yellowfin, 1 skipjack on jig1/
3.	21-05	72-13	Feb. 5	2020	Skipjack+blackfin	5	4 skipjack, 16 blackfin on jig1/
4.	12-24	63-00	Feb. 15	1402	Yellowfin	50	None caught1/
5.	11-58	63-07	Feb. 15	1905	Skipjack	100	None caught1/
6.	12-23	62-27	Feb. 24	1430	Yellowfin	100+	15-50 lb. fish; would not take bait.
7.	12-24	62-13	Feb. 24	1550	Skipjack	60-70	1 on jig; would not take bait.
8.	12-21	62-05	Feb. 24	1818	Yellowfin+skipjack	20+	Would not take bait.
9.	12-44	61-40	Feb. 27	2005	Yellowfin	30-40	80-lb. fish; would not take bait.
10.	18-57	68-07	Mar. 2	1550	Skipjack	20	Caught 155 with bait; 1 on jig.

1/No bait aboard.

Note: The only catch not included in this table was at 12-53, 62-25, on February 25 at 1830 GMT, when 56 small skipjack were caught on bait from an estimated 1-ton school.

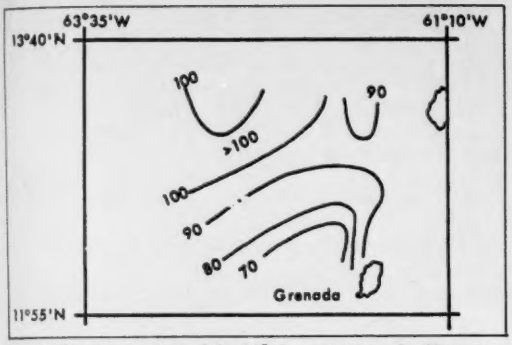


Fig. 2 - Depth in meters of the 24° C. isotherm in St. Vincent area, February 24-27.

Investigate Distribution and Biology of Bait

Although conditions at Aguadilla were nearly ideal for night baiting, very little bait was seen under the light (about 25 scoops), and this only for a short period. Local fishermen at Isla Lobos and Punta Arenas (Venezuela), where bait was purchased on previous cruises, said they had seen none in the area for several days.

Bait was finally made at the U. S. Naval Station, Trinidad. A daylight attempt was unsuccessful, but night baiting while tied to the dock was carried out without difficulty. Two hundred scoops were taken in two sets; at least 1,000 more scoops were still under the light when operations were terminated. This fish was an anchovy (close to Anchoviella eurystole) which may be a previously undescribed species of Engraulis. Tropical Atlantic Biological Laboratory's Systematics of Fishes Program will investigate the problem further. Survival of the bait was very good; about 70 scoops were still alive on arrival in Miami.

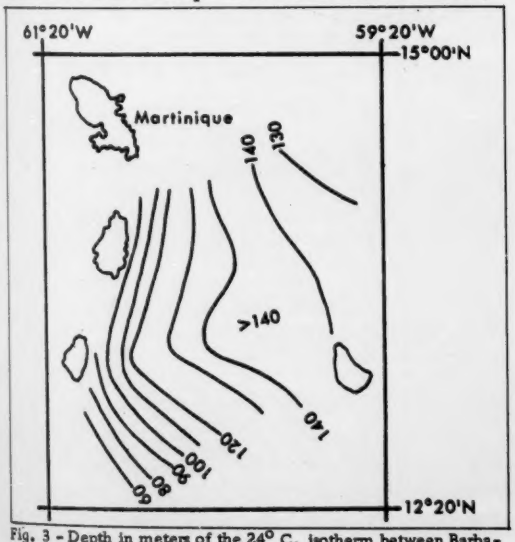


Fig. 3 - Depth in meters of the 24° C. isotherm between Barbados and the Antilles.

Survey Physical Oceanography

A physical oceanography survey between the Antillean Arc and Barbados was carried out February 19-February 23. Depths of the 24° C. isotherm are shown in Figure 3. Operations were continuous through the 24 hours; tuna scouting was carried on during daylight hours. No tuna schools were spotted.

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The Undaunted sailed on its present cruise with special equipment: 25 bicycles and 8,000 used schoolbooks for the children of Cartagena, Colombia. The Colombian city was adopted as its "sister city" by Coral Gables, Florida, which is active in the "People-to-People" organization. The bikes and books were donated by the people of Miami.

Juneau Reports on Alaskan Shrimp

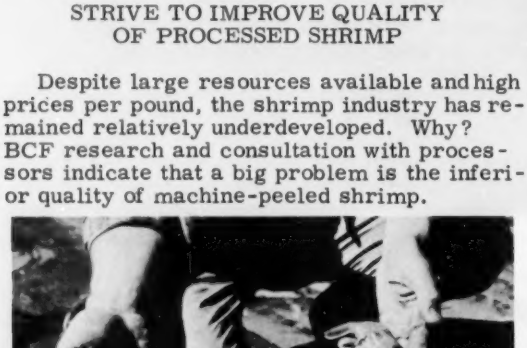
BCF's Juneau, Alaska, office has issued a newsletter devoted to the shrimp industry and designed to help Alaska fishermen and processors. It reviews the history of the fishery, growth of foreign activity off Alaska, and discusses "our shrimp programs in processing, locating stocks, gear development, and biological research."

The Juneau staff believes that the shrimp industry seems "ripe for an abrupt expansion." The apparent leveling off of the king crab fishing near Kodiak has stimulated interest in shrimp. It is likely that at least 20 shrimp vessels will be operating in the Kodiak area alone before the end of 1967; only 3 trawlers fished shrimp in 1965. Some estimates of shrimp potential are as high as 400 million pounds annually--over twice that for king crab. In 1966, about 25 million pounds of shrimp were landed; Kodiak was the leading port. The newsletter says: "Though we can only specu-

late, the total catches by Alaska fishermen during this current year could exceed 40 million pounds."

STRIVE TO IMPROVE QUALITY OF PROCESSED SHRIMP

Despite large resources available and high prices per pound, the shrimp industry has remained relatively underdeveloped. Why? BCF research and consultation with processors indicate that a big problem is the inferior quality of machine-peeled shrimp.



The larger pandalid species caught in the Gulf of Alaska: left, coon-stripe shrimp; right, spot shrimp; bottom, side-stripe shrimp.

The processors know that the best way to produce a top-quality product is to start with fresh, high-quality, raw shrimp. But they find that too-fresh shrimp cannot be peeled economically by machine. The shrimp break on the machine, and more labor is needed to inspect and discard partially peeled shrimp. Peeling efficiency can be improved and costs cut by holding shrimp in ice for at least 2 days before peeling. But this also creates problems because holding shrimp reduces their quality substantially. Lost are the important contributors to the original high quality: nonprotein nitrogen, sugars, free amino acids, and nucleotides. As a result, the color, flavor, odor, and texture of the finished product suffer. And pale-colored shrimp meet buyer resistance.

The first challenge to technology is: Find a technique to condition fresh shrimp for machine peeling as a substitute for holding them in ice. Experiments at BCF's Technological Laboratory at Ketchikan, Alaska, showed that cooked shrimp tended to retain color in the peeling process. To test results under commercial production conditions, BCF technologists conducted experiments at the Harbor Seafoods plant in Wrangell to see if heat-treated shrimp could be machine peeled and their color remain bright during peeling.

Heat Put On Them

In one series of experiments, 60-pound batches of shrimp, caught only 3 to 5 hours before tests began, were cooked at different temperatures and for different periods. Then, the shrimp were processed in mechanical peelers. Higher temperatures improved color but resulted in poorer peeling; lower temperatures improved peeling but little color was retained. Two-cook sequences then were tested: 2 minutes at 110° F. to improve peeling, followed by 15 seconds at 150° F. to improve color. This double cook worked well: both color and peeling were good. The shrimp meats were canned for later color tests.

From a practical approach, the best the researchers could hope for would be to process shrimp about 24 hours after they are caught. So they allowed some shrimp to set overnight without ice at about 35° F. Then one lot was cooked 3 minutes at 110° F. and resulted in fair color and excellent peeling.

At this point, it seemed a double precook would improve color, flavor, and texture while keeping peeling characteristics similar to ice-held shrimp.

A second series of tests was conducted to determine if high- or low-temperature cook should come first--and how high a temperature could be used to get the best color and peelability. The researchers also needed to determine the yield of this technique compared to ice-held shrimp.

In each experiment, 100 pounds of shrimp held overnight in shrimp boxes without ice were used. The best results were obtained with a 15-second 165° F. first cook, and a 3-minute 110° F. second cook.

To estimate yield, 500-pound lots of shrimp were used. One lot was precooked at 165° F., followed by 110° F., before peeling. A second lot was iced normally and processed 2 days later. The yields were nearly the same, although the yield picture was complicated by formation of a gel in cans of precooked shrimp.

The researchers think shrimp quality can be improved significantly by a 2-stage heat treatment before machine peeling. The method has to be checked out in commercial scale trials. If successful, it will provide high-quality raw shrimp from the peeler that will win markets in new and conventional products.

Proper care of catches aboard vessels is of "paramount importance" in retaining quality. The staffs of BCF's Exploratory Fishing and Gear Research Base and the Ketchikan Technological Laboratory are perfecting methods of handling shrimp aboard vessels, including sorting and storing.

LOCATING AND HARVESTING SHRIMP

BCF's Exploratory Fishing and Gear Research (EF&GR) Base is headquartered in Juneau. Its staff investigates the State's marine waters and offshore waters. It defines the seasonal abundance and distribution of various fishery resources, and develops improved or new devices or methods for harvesting. BCF's "John R. Manning" is used and various fishing craft are chartered when needed.

The EF&GR shrimp program has dual purpose: to help develop a spot-shrimp fishery suitable for smaller vessels in order to alleviate the current seasonal unemployment of salmon fishermen; and to promote expansion of pink-shrimp fishery in central and western Alaska to provide jobs for men and vessels made available as king crab fishery levels off.

Currently, pink shrimp and spot shrimp interest commercial operators a great deal. Pink shrimp are most important because they are abundant and are distributed widely in Alaska waters. Spot shrimp are not as widely distributed nor as abundant as other species; however, because of their large size and high unit value, small, localized fisheries are developing in Southeast Alaska and Kachemak Bay (Cook Inlet). The EF&GR Base staff seeks to locate resources and develop improved harvesting methods; over half the base funds go into shrimp study.

Pink shrimp studies now seek to develop improved gear. Selective trawls to sort trash from catches--and modified trawls to permit fishing for various size-groups and/or species--have been constructed and will be tested this spring.

The Juneau staff believes there is need to reassess soon the shrimp stocks of the Shumagin Islands. Extensive exploratory trawling there in 1964 revealed the greatest concentrations of pinks of any area during a 4-year study. This was attested by foreign fleets operating there continuously since spring 1965. "There is no doubt that this fishing has had some effect on the abundance of these shrimp stocks." The Alaska fishing industry--presently faced with reduced catches of king crab in the Kodiak area--is turning to the shrimp resource. The Shumagin reassessment would provide industry with current information. It is the logical area for U. S. fishery expansion.

Spot shrimp or "prawns" have been part of the personal-use fishery for many years in Southeast Alaska, but only occasionally have they been taken commercially. During fall 1965, BCF began to investigate the resource to develop an off-season fishery for idle small boats of gillnet, troll, seine, and halibut fisheries. Gear development and exploratory fishing were equally important during this first year's study. As investigations continue, major emphasis will be on exploratory fishing but modification and refinement of gear and fishing methods will continue to receive attention.

As a result of BCF's preliminary work, a small pot fishery has started in Southeast Alaska, and limited numbers of these large shrimp are being marketed in the "lower 48" (the U. S.). Thus far, the fishery has used pots only. However, EF&GR recently constructed several small (35 ft.), modified, beam trawls that will be tested in late spring in areas of known spot-shrimp abundance. These trawls are designed for small boats (30 to 35 ft.), can be handled by one man, and are relatively inexpensive to build. Their compact size is easily controllable and they may prove entirely suitable for the restricted Southeast Alaska grounds where short tows and abrupt turns would effectively prohibit the use of more cumbersome otter trawls.

Exploratory fishing operations are being resumed this spring and will continue next fall and winter. The goal of spot-shrimp surveys is to assess the potential of all waters inside Southeast Alaska, using both pots and trawls.

BIOLOGICAL RESEARCH

Biological research on commercial species of Alaskan shrimp is an important part of the BCF program. Because of imminent expansion of fishing effort, the staff now is studying life histories, behavior, and means of determining abundance of shrimp stocks. This information will assist industry and management--and guarantee the resource's future.

One primary goal is to learn the life histories of the 4 commercially important Alaska species: sidestripe, pink, spot, and coonstripe. For all 4 species, generally, the eggs hatch in the spring, the young shrimp begin life as larvae, which float and swim about in the plankton while molting and changing shape several times. In their first summer, they change into adults; for the remainder of their life they live on or near the ocean bottom. All shrimp begin life as males and breed as males for 1 or 2 years. Then, they change into females and reproduce at least one time. They spawn in the fall. The female carries the fertilized eggs on the underside of her abdomen until spring, when the eggs hatch.

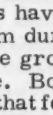
BCF has research station for shellfish investigations at Kasitsna Bay to study shrimp and king crab in central Alaska. Most field work involves early life and adult stages. The 38-foot "R/V Sablefish" and most research sampling equipment and supplies are there.

Emphasis is placed on learning to identify the larval stages of the four species. This is done by rearing known species in the lab and using the larvae as examples to determine the species of larvae captured during sampling at Kasitsna Bay and Auke Bay. It is important to be able to identify larval forms of each species and understand their later life histories--because, when the commercial fishery begins to harvest the shrimp, BCF will be asked to predict population abundance 1 and 2 years in advance. If the researchers know the abundance of juvenile forms, and their rate of growth, such predictions may be possible.

The 4-year-old study of adult shrimp has had several objectives. A marking technique has been developed for staining Alaska shrimp. These techniques will be put into practice when a suitable method of identifying marked animals in commercial landings is developed. With the present method of fishing and processing, individual marked shrimp cannot be detected easily. A good idea of the percentage of marked animals captured is needed to calculate abundance of various stocks. The researchers also are studying changes in abundance of adult shrimp in several areas in Kachemak Bay. Results indicate seasonal migrations will affect the commercial harvest from month to month. When these migrations are understood, the scientists will be able to advise fishermen of times and areas where heavy concentrations are likely to be found.

The adult-shrimp study also involves research on environment, food habits, and activities of shrimp. In shallow waters, divers equipped with SCUBA have observed the activities of shrimp in their natural environment. By using surface-to-bottom strings of pots, the scientists have learned that shrimp move off the bottom during nighttime hours and stratify by size groups--smaller shrimp nearer the surface. Bottom trawling experiments have shown that fewer but larger shrimp could be captured by night fishing. Basic information on shrimp behavior provided by BCF biologists is used by EF&GR staff to perfect fishing techniques.

The Alaska Department of Fish and Game is studying the life history of shrimp of Southeastern Alaska. This work is supported by Federal funds. Headquartered at Wrangell, this project provides data on species composition, size, and sex composition of the commercial catch. The observations are supplemented by year-round sampling with small-mesh otter trawls to learn distribution, abundance, and growth rates of juveniles that escape commercial gear.



Stanford Lab Cuts Cost of Ocean Data

On March 13, 1967, the "SS Californian" of the Matson Navigation Co. began using radio teletype (RATT) to transmit automatically digitized temperature-depth data to shore. It was the most recent development in the pilot project of BCF's Biological Laboratory in Stanford, Calif., to demonstrate the feasibility of obtaining ocean monitoring data at low cost by using expendable bathythermograph (X BT) systems aboard merchant and fishing vessels.

The Stanford lab is analyzing the data for seasonal variation of temperature and flow in the California Current. Such studies are essential to BCF's efforts to develop fisheries forecasting capability. The project is an outstanding example of industry cooperation with Government--in this case, Matson with BCF and the Navy. The XBT system was placed aboard Matson bulk cargo and container vessel, SS Californian. About twice a month since June 1966, the ship's personnel have made observations at approximately 100 nautical mile intervals along the great circle track from Honolulu to San Francisco. The subsurface temperature observations can be obtained without slowing the ship's speed, which is necessary unless the expendable instrumentation is used.

Rapid Transmission of Data to Shore

Prompt relay of observed data to shore plays an essential role in environmental monitoring to provide weather, oceanic, and fishing advisories by radio to fishing vessels. Radio station WWD, licensed to BCF Tuna Resources Laboratory and operated with cooperation of Scripps Institution of Oceanography, helps develop communication capabilities and receives RATT transmissions. WWD is a prototype station for a network to provide an ocean data service. It is rapidly improving its capabilities for scientific communication service to fishing vessels, research ships, and merchant ships that cooperate in providing scientific data.

The project is a prime example of Government-industry cooperation to save much money. The idea of using ships of opportunity was generated at the Stanford lab. But the project could not have got underway without the expendable instrumentation developed by Sippican Corporation, the platform and cooperative personnel to make observations provided by Matson, financial support from the Oceanometrics Program of the Navy Electronics Laboratory, and encouragement and technical assistance from the Fleet Numerical Weather Facility.

To illustrate the relative economy of using ships of opportunity, it is estimated that annual operating costs to obtain 4 sections per month, using the SS Californian, would be about $40,000. This excludes costs of communication but includes preliminary reduction of data. If it were necessary to charter a suitable, inexpensive, but slower, vessel to collect equivalent data, the annual operating cost would be about $500,000.

BCF Aquanauts Train for SeaLab III

BCF will participate in SeaLab III, a Navy experiment designed to enable man to learn to live and work on the ocean floor for extended periods. SeaLab III is scheduled for the winter of 1967 and will be the third in a series of experiments in undersea living of the Navy's Man-in-the-Sea Program. Five teams of Navy divers and civilian scientists will operate from a submerged laboratory at 430 feet off Southern California. They will perform engineering and scientific work over a 60-day period.

Three BCF scientists are participating: Richard A. Waller, Division of Biological Research, the BCF Project Chief; Richard A. Cooper, Boothbay Harbor Biological Laboratory; and James M. Scott, La Jolla Tuna Resources Laboratory.

Some biological studies to be carried out during the experiment are: animal transplants, animal tagging studies, observations on animal behavior, environmental monitoring, and time-series biological studies with elapsed-time cameras.

Will Use Artificial Breathing Gases

During SeaLab III, the undersea laboratory will be pressurized to the prevailing depth of about 430 feet so that personnel will have free access to the outside environment. At this high pressure, it will be necessary to breathe a synthetic gas mixture of oxygen and helium because compressed air cannot be used by divers below about 300 feet. The concept of divers using artificial breathing gases under extreme high pressures is a recent development; it is called "saturated diving". Before the technique was worked out, the depth and duration of dives were critically limited, and undersea living experiments were not feasible.

In one phase of the training requirements, Richard Waller completed an 8-day simulated dive in a pressure chamber at the Navy's Experimental Diving Unit in Washington, D. C. He was subjected to pressures up to 215 lbs. psi (equipment to water pressure at 450 feet)

and artificial breathing mixtures of helium and oxygen. Richard Cooper completed the 450-foot test in April. Michael Scott will undertake this phase of the training during the summer. The simulated saturation dives are required of all "aquanauts" to determine their tolerance of the high pressures and synthetic breathing gases to be used in SeaLab III.

Retail Clinics Help Industry

BCF marketing personnel are working to make the fishing industry more competitive with other industries by improving merchandising practices. They are conducting seafood retail merchandising clinics on a pilot basis for meat cutters and seafood countermen in selected areas.

The clinics are two 3-hour sessions that emphasize purchasing, handling and thawing techniques, cutting, display ideas, and the basic economics of retailing and pricing seafoods.

Associated Grocers reported to BCF that in its 8 stores in the area of Olympia, Washington, sales of fresh fish had averaged 300 pounds per week per store for 3 years. After the new merchandising program was started, sales soared to a 1,100-pound average.

To Sell Fishery Products Retail at Fairs

BCF is adding yet another approach to its promotion of foreign trade. When it introduces new fishery products into European markets, it will hire a professional U. S. food merchandiser to sell the products at retail prices at the fair sites. To help defray the cost of the operation, 25 percent of the receipts will be taken from the retail sale of each product; the remainder will be given to the participating U. S. firms.

The new approach will be tried at 3 fairs in fall 1967--Dublin, Ireland; Leeds, England; and Dijon, France. Only products new to these areas will be eligible.

Fur Seal Prices Mostly Lower

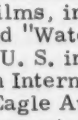
At the Fouke Fur Co.'s spring auction in Greenville, S. C., April 6-7, 20,700 Alaska fur sealskins were sold for the account of the U. S. Prices for blacks, Kitovis, and Lakodas declined from the record high sale of a year earlier and the fall sale of October 1966.

Blacks averaged about $90, down 20 percent; Kitovis averaged about $77, down 11.5 percent; and Mataras $93, unchanged. Natural Lakoda skins were virtually unchanged at average $67; dyed Lakodas averaged about $27, down 35 percent from last fall.

BCF Films in "Oscar" Test

The U. S. Information Agency has selected 13 Government films, including BCF's "Flavor of Maine" and "Watermen of Chesapeake," to represent the U. S. in competition for the CINE (Council on International Nontheatrical Events) Golden Eagle Award. This is the first time Government-produced films have been permitted in the competition.

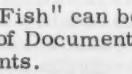
CINE is a voluntary, nonprofit organization set up to coordinate the selection of U. S. nontheatrical, short subject, and TV documentaries for competition in overseas film festivals.



New Book's Message: "Let's Cook Fish"

BCF has produced a 52-page color publication--"Let's Cook Fish"--to serve as a complete guide to basic fish cookery. It includes information on buying, handling, storing, and preparing fish. It seeks to arouse more interest in fish as an everyday food by emphasizing variety, economy, and nutritional value.

"Let's Cook Fish" can be bought from the Superintendent of Documents, Washington, D. C., for 60 cents.



Crowther and McHugh Named Director and Deputy Director

The Department of the Interior has named H. E. Crowther director and Dr. J. L. McHugh deputy director of BCF. They had been serving in acting capacities. Mr. Crowther was deputy director before becoming acting director Nov. 1, 1966. Dr. McHugh was assistant director for biological research until Nov. 3, 1966, when he was appointed acting deputy director.

"Both men have 30 years' experience in fishery research and administration and are eminently qualified to head the Bureau," Secretary of the Interior Stewart L. Udall said at the swearing-in ceremony May 2.

Harold E. Crowther

Born in Laurel, Maryland, Mr. Crowther received his BA in 1933 and his MS in 1935 from the University of Maryland. In 1936, he was employed by a private company to conduct research on fishery products. In 1943, he joined the Marine Corps and served as an officer in the South Pacific. From 1946 to 1949, and from 1953 to 1956, he was employed in the fishing industry in Massachusetts. At first, he was a research scientist, and later an executive. In 1949, he entered Government service. For 4 years he served as Chief, Exploratory Fishing Section, and Chief, Technology Section, Fish and Wildlife Service. He came back to the Fish and Wildlife Service in April 1956 as BCF's Coordinator of the Saltonstall-Kennedy Program. In November 1957, he was promoted to Chief, Division of Industrial Research and Services; in June 1961, he became Assistant Director (now Deputy Director).

In 1961, President Eisenhower appointed him a U. S. Commissioner of the International Pacific Halibut Commission and he continues to serve in that capacity. He has served too in international fisheries conferences.

For 8 years before coming to BCF in 1959, Dr. McHugh was Director of the Virginia Fisheries Laboratory and Professor of Marine Biology at the College of William and Mary, Williamsburg, Va.

Dr. J. L. McHugh

He was born in Vancouver, B. C., and received his bachelor's and master's degrees from the University of British Columbia. He served the Biological Staff of Canada's Fisheries Research Board from 1938 until 1941. During World War II, he was an infantry officer with the Canadian Army in England and France.

After earning his doctor of philosophy degree at the University of California's Scripps Institution of Oceanography, Dr. McHugh moved to Virginia to head the State's marine fishery program at Gloucester Point. He became a United States citizen in 1958.

He is the author of 70 publications on fishery biology, ichthyology, and biological oceanography, a member of scientific societies, and a trustee of the International Oceanographic Foundation. He has been a member of many United States delegations to international fishery meetings in Europe, Latin America, and the Far East.

Develop Fish Food in Ice Cubes

Biologists of BCF's Ann Arbor (Michigan) laboratory have developed a unique method of feeding plankton to alewives, smelt, and coregonids (whitefish) in experimental aquaria. They freeze wild zooplankton in small ice cubes. When the cubes are placed in a tank, they float and gradually melt--releasing the animals. As the animals drift toward the bottom, they are taken readily by the fish.

INTERNATIONAL

FAO Caribbean Project Issues Report No. 1

The UN's FAO Caribbean Fishery Development Project vessels "Alcyon" (Jamaica) and "Calamar" (Barbados) carried out experimental fishing for pelagic fishes using the long-line method December 1966-February 1967. Its first cruise report says that the fishing was not productive when viewed against a commercial potential. The best single day's catch (excluding sharks) was 1,000 pounds. However, in assessing catches, certain factors should be considered: the inexperience of crew and trainees; the amount of gear set out never exceeded 75 and averaged 55 baskets--only 15 percent of gear set by Japanese crews for one day's fishing; the early winter season is not particularly good for taking large pelagic species in the Caribbean. But, the report notes, no fishing time was lost, although moderate to strong breezes prevailed.

The area investigated included the Caribbean Sea; west of Cayman Islands; south to the Netherlands Antilles (Curacao Area); and east to the Windward Islands. In the adjacent North Atlantic, fishing was conducted south and east of Barbados and north of Haiti and Dominican Republic.

The long-line gear used has a "basket" (one unit) composed of 7 mainline sections each 30 fathoms long. Five or 6 branch lines were attached to the mainline and these, including the "sekiyama" and leader, measure 12.5 fathoms. This gear was suspended from surface floats by buoy lines 12 fathoms long. The gear fished a depth of 40 to 60 fathoms.

Typically, up to 75 baskets of gear were set out in early morning and retrieval began about midday. The Calamar made one night set. The hooks were baited with either herring (Clupea harengus) or flyingfish (Hirundichthys affinis).

Tuna Information Obtained

Information on distribution and abundance of tunas and spearfishes resulted from the fishing. Although overall catch rate (fish per 100 hooks) was low, the number of spearfishes taken was surprisingly high. The Calamar, working generally to the south and east of the Alcyon, took more white marlin than any other species. These catches apparently indicate concentrations of white marlin off the north coast of South America during winter. Some of these were tagged and released in cooperation with the Woods Hole Oceanographic Institute. Blue marlin were more abundant in the Alcyon's catches.

The crews also made observations of oceanographic features, including temperature and salinity to 150 fathoms. (UNDP/FAO, Project Headquarters, Barbados, West Indies, March 10, 1967.)

International Convention for Fishing in the Northwest Atlantic

ROMANIA TO JOIN

The Romanian State Council, by Decree No. 34 published in the Official Bulletin of January 30, 1967, approved Romania's adherence to the International Convention for Fishing in the Northwest Atlantic (ICNAF). The State Council Act provides the necessary authority for Romania to complete the act of adherence. However, she will not be a member of ICNAF until "a note of adherence" is received by the ICNAF Depositary Government, the United States. The note is expected in the near future.

Romania purchased 2 large factory stern trawlers from Japan in 1963 and began fishing on Georges Bank in 1965. In 1966, one stern trawler operated off southeastern Georges Bank from June through early October (4½ months).

Denmark and Norway Study Mutual Landing Rights

The Norwegian Fisheries Department is considering the question of reciprocal landing

rights between Denmark and Norway and has arranged meetings with Norwegian fisheries associations to discuss it. No formal approach to Danish authorities has yet been made. ("Vestkysten," Feb. 21, 1967.)

Talks on Asian Fishery Center Held in Bangkok

The working party to establish the fishery development center in Thailand, designated by the Southeast Asia Economic Development Conference in Tokyo, December 1966, met in Bangkok on March 13, the Japanese Foreign Office announced.

It discussed Japan's proposal to give priority to training in fishery techniques over other programs designed to develop southeast Asia fisheries.

Japan, Thailand, South Vietnam, Indonesia, and Singapore were expected to be represented. The attendance of several other Asian countries, including the Philippines and Malaysia, was doubtful. ("Suisan Keizai Shimbun," March 7, 1967.)

Fish Meal

FEO'S 1966 PRODUCTION AND EXPORTS WENT UP

The exports of member countries of the Fish Meal Exporters' Organization (FEO), which account for about 90 percent of world exports of fish meal, rose from 2,012,000 metric tons in 1965 to 2,148,000 in 1966. The FEO countries are Chile, Angola, Iceland, Norway, Peru, and South Africa/South-West Africa.

Country	Jan.-Dec.	
	1966	1965
	(1,000 Metric Tons)	
Chile	185.9	63.7
Angola	53.6	49.2
Iceland	172.7	146.2
Norway	266.4	268.2
Peru	1,304.5	1,260.0
So. Africa (including S.-W. Africa)	165.6	224.9
Total	2,148.7	2,012.2

The 1966 production of FEO countries was:

Country	Dec.		Jan.-Dec.	
	1966	1965	1966	1965
	(1,000 Metric Tons)			
Chile	3.9	15.9	194.2	70.3
Angola	5.0	7.1	54.7	47.7
Iceland	18.6	20.7	181.8	172.1
Norway	2.1	4.2	421.7	309.2
Peru	187.3	213.8	1,470.5	1,282.0
So. Africa (including S.-W. Africa)	1.7	1.2	257.6	272.0
Total	218.6	262.9	2,580.5	2,153.3

Convention Drafted on North Atlantic Fisheries Conduct

Representatives of 18 countries that fish the North Atlantic (the U. S., Canada, and 16 European nations) have adopted and referred to their governments for approval a Convention on the Conduct of Fishing Operations in the North Atlantic. The 18 have participated in a Fisheries Policies Conference, which met in London 4 times starting in 1965.

The Convention establishes an international code of conduct for fishing vessels and ancillary craft. It is designed to increase safety at sea, particularly on international fishing grounds, and to reduce risk of damage to boats and fishing gear when vessels using different fishing methods operate close to each other.

It contains provisions for marking vessels to ensure identification at sea. It establishes uniform supplementary light signals. It sets up uniform methods of marking nets and other gear in the sea--and a code of good conduct on fishing grounds. Further, the Convention provides conciliation procedure to facilitate settlement of small claims arising out of gear damage involving fishermen of different nations; also, an inspection system whereby authorized officers from participating countries will be able to board and inspect fishing vessels in certain circumstances for possible violations of rules or damage. It will be possible for certain countries to "opt out" of the boarding provisions, but other aspects of the inspection system--e.g., observation and reporting of violations to the authorities of the fishing vessel's flag state--will apply uniformly to all.

The Convention itself will be open for signature in London June 1-November 30, 1967. Then it will be subject to ratification by the U. S. upon advice and consent of the Senate.

The 18 Conference Countries

The countries represented were: Belgium, Canada, Denmark, France, Federal Republic of Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, USSR, United Kingdom, and the U. S.

The conference stemmed from the European Fisheries Conference of 1963/64. A resolution was passed then that the United Kingdom convene a technical conference of all countries in the North-East Atlantic fisheries to draft a modern code of fishing conduct. It also was resolved to invite representatives of the U. S. and Canada to attend so that extension of convention provisions to the North-West Atlantic fisheries might be considered. The Convention will cover the area off the coasts of Canada and the U. S. as far south as Cape Hatteras, where many nations fish.

Representatives of State and Interior Department and the U. S. Coast Guard met several times with representatives of fishermen along the Atlantic coast to prepare for negotiating the Convention.

The U. S. delegation consisted of John T. Gharrett, Regional Director, BCF, Gloucester, Mass., Chairman, and Raymund T. Yingling, State Department, Vice-Chairman. William L. Sullivan Jr. of State was a delegation member. Lt. Comdr. C. J. Blondin, U.S. Coast Guard, and John B. Skerry, BCF, were advisers. (U. S. Department of State, March 21, 1967.)

Inter-American Tropical Tuna Commission

RECOMMENDS 84,500-TON YELLOWFIN QUOTA

On April 6, the Inter-American Tropical Tuna Commission recommended that nations harvesting yellowfin tuna in the eastern Pacific set up a catch limit (quota) of 84,500 short tons for calendar year 1967.

GATT Reports on European Market for Shrimp

The GATT International Trade Centre, designed to help developing nations promote their export trade, has released a study of "Major Markets for Shrimp and Prawns in Western Europe." GATT is the General Agreement on Tariffs and Trade. The study is available in English, French, and Spanish editions from the Information and Library Service, GATT secretariat, Villa Le Bocage, Palais des Nations, 1211 Geneva 10; price US$5.00.

The study stresses that continued expansion of U. S. demand is crucial to existing shrimp industries of developing countries; also, many of these countries have abundant shrimp stocks, and they must realize their export potential by stimulating demand in high-income European markets. The GATT analysis of selected European markets aims to acquaint the shrimp industry of the developing countries with recent developments in production, consumption, trade, prices, pattern of marketing and distribution channels in the United Kingdom, France, West Germany, and Switzerland.

Reports Revolutionary Changes

The report focuses on revolutionary changes in food distribution, consumption, and the remarkable advance of frozen foods. It encourages the promotion of seafood specialties, such as shrimp and prawn. It deals with such critical aspects of shrimp marketing as standards of sanitation, quality control, and improved methods of production.

The study contains conventional market indicators to help processors/exporters in developing countries pursue trading opportunities that exist or may develop. And it suggests, based on the U. S. shrimp bonanza, joint action through a European Shrimp Council to promote shrimp consumption. (GATT, Mar. 16, 1967.)

FOREIGN

CANADA

1966 LANDINGS AND VALUE ROSE

Canadian fishery landings (including Newfoundland) totaled 2.5 billion pounds in 1966 with an exvessel value of C$153 million, as against 2.3 billion pounds at C$142 million in 1965. Over half the 1966 value was accounted for by three species: salmon, cod, and lobster.

Canadian Landings of Principal Species, 1965-1966

Species	1966 Landings	1965 Landings	1966 Value	1965 Value
	(1,000 Lbs.)		(1,000 C$)	
Atlantic Coast:				
Cod	561,201	575,439	24,654	23,641
Haddock	113,106	92,579	8,040	6,045
Pollock	34,589	51,456	1,379	1,869
Flounder and sole	232,312	201,647	7,707	6,462
Herring	550,835	405,460	6,215	4,249
Swordfish	6,890	7,807	2,976	3,254
Lobsters	37,210	40,524	20,827	26,636
Scallops	18,259	19,709	7,454	10,847
Pacific Coast:				
Halibut	31,470	32,973	11,282	11,112
Herring	305,783	444,063	5,570	6,232
Salmon	153,237	90,192	32,551	25,958

The 1966 season was marked by a good salmon catch in British Columbia and the buildup of the Atlantic herring fishery. On the other hand, Pacific herring landings were down sharply. Lobster landings also were down. East Coast groundfish landings of 1.2 million pounds were up about 9 percent from 1965 due to heavier landings of ocean perch, haddock, and flounder. ("Monthly Review of Canadian Fishery Statistics.")

* * *

SURVEYS MANPOWER OF DEEPSEA FISHERY

Canada's Department of Fisheries is conducting a manpower survey of the deepsea fishery off the Atlantic Coast "to obtain essential information about offshore fishermen, their training for their occupation, and to determine the general attitude of fishermen toward their livelihood." The study is being carried out by the Department's Economics Services to provide answers to questions asked by industry, the Federal-Provincial Atlantic Fisheries Committee, and other agencies.

The confidential economic and sociological study includes the manpower situation of vessel owners and fish-processing companies. It focuses on vessels of over 100 gross tons. It will produce data on categories of labor on offshore boats and shore plants, their skills and how they learned them, and the future needs for fishermen and plant workers and the training they will need. A major survey purpose is to get the necessary information to project requirements to 1975.

Questions for Owners and Workers

Two questionnaires are being used. One is for vessel (or plant) owners and operators, the other for individual fishermen. Crewmen are asked about work and life at sea, the types of boats or jobs they prefer, and their years of experience.

Vessel and plant operators are asked more technical questions about requirements at sea and ashore--e.g., incentive measures to encourage recruitment and hold on to good personnel. They can comment generally on offshore fisheries and their problems.

The Department of Fisheries points out that the survey seeks solely to assess properly the needs of the offshore industry. To aid those in the industry, it says, it needs to know the manpower and training requirements for today and for the future. ("Fisheries of Canada," March 1967.)

* * *

WEST COAST HERRING MEAL OUTPUT DECLINES IN 1966/1967

British Columbia herring meal production for the 1966/67 season was only 23,356 short tons--down 27 percent from 1965/66 and 46 percent from 1964/65. An official of the Canadian Federal Department of Fisheries blamed "environmental" factors, not overfishing, for the herring catch decline. He also discounted the effects on herring of Soviet fishing off British Columbia--only for Pacific ocean perch.

Canada (Contd.):

In January 1967, some British Columbia herring grounds were closed for the season to protect spawning herring. Then, on Feb. 5, a 2-week ban on all herring fishing was imposed. The closure was supported by both labor and management associations. They also called for an increase in the net mesh to $1\frac{1}{4}$ inches over a 5-year period. (U. S. Consul, Vancouver, Feb. 14, 1967, and Canadian Department of Fisheries, Mar. 9, 1967.)

* * *

SCOTTISH SEINE SCORES HIGH IN FISHING TEST

The advantages of Scottish seine-netting over other methods for catching certain groundfish were demonstrated in Atlantic coastal waters during the winter by the "Guiding Star." Many fishermen are convinced. One vessel, designed exclusively for this technique, is under construction.

The Scottish vessel (and crew) was chartered last October for a year by the Industrial Development Service of the Canadian Federal Department of Fisheries.

The first 5 months were very successful, particularly off Nova Scotia. Fishing on the same grounds as the Danish-type seiners of the Atlantic Provinces, the Guiding Star repeatedly caught twice, sometimes 3 times, as much as the Canadian vessels. On one good day, in 5 tows off Cheticamp, Nova Scotia, she landed 19,000 pounds of fish--mostly cod, haddock, and flounder. Before going to Nova Scotia, she took so many fish off Newfoundland in one tow that the net burst.

Scottish Technique Effective

One advantage of Scottish seine-netting is the relatively low horsepower needed. The 73-foot Guiding Star is powered by a 152-hp. diesel engine. Her success demonstrates that many vessels, such as long-liners with insufficient power for trawling, can use the Scottish technique effectively and economically.

The Guiding Star carries two sizes of nets, the 420 and 520 Vinge trawls, which have a much higher vertical opening than conventional nets now used in Canada. They are the main reason for the large hauls of demersal fish. The deck layout and machinery allow fast hauling and shooting. Electronic equipment is used to locate and remain with schools of fish on suitable bottom.

The vessel is now moving from port to port along the Nova Scotia coast, from Cheticamp to the western part. Later, the spring and summer 1967, she will fish from New Brunswick, Prince Edward Island, Quebec, and then return to Newfoundland. (Canadian Department of Fisheries, Ottawa, March 7, 1967.)

* * *

EXTENDS FISHERIES INSURANCE PROGRAM TO ONTARIO

The Canadian Federal program that offers protection to fishermen for partial or total loss of vessels, fixed gear, and shore installations became effective in Ontario on April 1. Known as the Fishermen's Indemnity Plan, it already covers the Maritimes, Newfoundland, Quebec, and British Columbia.

Under the plan, Ontario owners of vessels, fixed fishing gear (traps, etc.), and shore installations having an appraised value of up to $15,000 may obtain insurance coverage with a premium of one percent of the appraised value. Losses due to storms, ice, fire, and other recognized perils are covered. The owner recovers 60 percent of the appraised value for total loss, and a lesser indemnity for partial loss. (Canadian Department of Fisheries, Ottawa, March 29, 1967.)

* * *

FISHERIES TRADE MISSION VISITS EASTERN EUROPE

A 4-man Canadian trade mission started a two-week tour of Europe on February 20 seeking markets for fish, according to a Canadian newspaper. The mission was particularly interested in selling frozen fillets and blocks. Its itinerary included Czechoslovakia, Romania, Hungary, and Yugoslavia. (U. S. Consul, St. John's, Feb. 27, 1967.)

LATIN AMERICA

Peru

SETS QUARTERLY EXPORT QUOTAS OF FISH MEAL

Peruvian export allocations of fish meal for the second quarter of 1967 are:

Country	Allocation Metric Tons
United States	No limit
Western Europe (except West Germany)	175,000
Eastern Europe	65,000
West Germany	60,000
Latin America	32,000
Asia-Australia	20,000
Total	352,000

Fish meal prices on world markets continue to decline. On March 21, Peruvian fish meal, f.o.b. Callao, was US$100 a metric ton for shipments to U. S. ports, and US$112 a ton for shipments to European ports. (In late February, prices were $115 or less for U. S. ports and $120 a ton for European ports.) Production during the 1966/67 fishing season is expected to reach 1.6 million metric tons, despite a 6-week strike and a 4-week closed season (February 15-March 14). The Government is expected to announce soon the allowable catch of anchovy for the season--it may exceed 8 million tons--and the closure date (expected in June). (U. S. Embassy, Lima, March 23, 1967.)

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PRESIDENT MEETS WITH FISH MEAL PRODUCERS

Over 100 fish meal producers met with President Belaunde on March 16, 1967, to express their views on the "crisis" of the fish reduction industry. The President recognized its gravity and promised an exhaustive study. Five members of the Interministerial Commission (Ministers of Agriculture, Development, Finance, Labor, and Navy) attended. As their part of the bargain, the producers reportedly agreed not to close their plants and "lock out" the workers, as the local press headlined.

The Federation of Peruvian Fishermen, a trade union, said that it would ask the Government to take over operation of the plants, if the industry close them. It denied that high wages were a cause of the crisis. According to a spokesman of the National Fisheries Society, the trade association of producers, 35 plants out of 154 have gone bankrupt already because of high costs and excessive taxes. There are reputed to be $13 of "hidden taxes" per ton, which producers object to strongly. The spokesman said that if the crisis was not solved quickly, the remaining plants would also go bankrupt or fall into foreign hands, "as is occurring already."

Meeting Resulted from Fisheries Society Proposals

The meeting with the President resulted from a heated assembly of the National Fisheries Society on March 14. Several motions were passed over the protests of a stubborn minority. The motions: (1) request the Government to close all plants temporarily; (2) obtain recognition by the Government that the industry is suffering a grave crisis; (3) ask to see President Belaunde to explain the industry's position; (4) obtain equitable tax treatment for the industry; and (5) continue talks with the Interministerial Commission and the congressional committee that also are studying the situation.

Fishing, suspended for a month at the recommendation of the "Instituto del Mar" to allow the "peladilla" to mature into anchoveta, reopened March 15. The plants had been reported processing up to 80 percent "peladilla," or immature fish, which substantially increases costs. Catching or processing "peladilla" is prohibited by a 1958 supreme decree which, apparently, has not been enforced. In any case, stocks of fish meal were reported to exceed 550,000 metric tons as of mid-March, while prices continued to drop. (U. S. Embassy, Lima, March 17, 1967.)

Mexico

RELEASES FIRST 1966 FISHERIES DATA

The 1966 production of the Mexican fishing industry continued the slow but steady increase of the last several years, preliminary data of the Secretariat of Industry and Commerce reveal.

Mexico (Contd.):

Landings of edible fish and shellfish reached a record 171,504 metric tons, compared to the previous high of 161,474 tons in 1965. All weights are "as landed"; i.e., heads-on, heads-off, cleaned, round. This is an increase of 6.2 percent, somewhat greater than previous increases.

Most important species of food fish showed good gains. Shrimp, by far the most important, reversed its recent downward trend. Landings were 39,743 metric tons, 11.7 percent better than 1965--but that was the poorest year since 1958. The anchovy is rapidly becoming an important species, and the 1966 catch of 13,748 tons is a record. Sierra mackerel, giant sea bass, and spiny lobster catches were records. The No. 2 species, oyster, reached a production of 19,921 tons, down 12.7 percent from the 1965 record of 22,818 tons. Sardines, mackerel, and abalone catches also declined.

Record Production of
Industrial Fishery Items

Production of industrial fishery items was also at an all-time high. The harvest of giant kelp returned to the 1963-64 level after a slump in 1965. Production in 1966 was 22,211 metric tons, up 37.4 percent from 1965's low of 16,169 tons.

The slowly growing fish meal industry broke all records with a production of 9,602 metric tons, up 35.2 percent from 1965's record of 7,104 tons.

The combination of a small increase in shrimp catch and a large advance in prices pushed the value of 1966 shrimp to 656.8 million pesos ($52.5 million), the highest level since 1963 and up 19.1 percent over 1965. As a result, shrimp resumed fourth place among all exports--overtook corn and trailing only cotton, coffee, and sugar. (U. S. Embassy, Mexico, March 15, 1967)

* * *

1966 CATCH ROSE IN
YUCATAN AND QUINTANA ROO

In 1966, the fishery catch of the Mexican State of Yucatan and Territory of Quintana Roo increased significantly--particularly of such valuable species as red snapper, grouper, and spiny lobster. Catches of principal species were:

	Yucatan	Quintana Roo
	. . . . (Metric Tons)	
Grouper	7,642.0	92.5
Red snapper .	947.4	-
Spiny lobster .	-	56.5
Other	2,469.1	448.5
Total . . .	11,058.5	597.5

In Yucatan, the 1966 catch of red snapper more than doubled 1965's 467 metric tons. The increase resulted from an addition of 17 vessels (55-67 feet long) in the fleet fishing especially for snapper.

* * *

NEW SEAFOOD FREEZING PLANT OPENS

Refrigeradora de Tepepan, S.A. de C.V. recently opened a freezing plant and branch office at Ciudad Juarez, Chihuahua, to distribute Pacific seafood. This company is the Federal Government's seafood freezing agency and forms part of the plans to increase fishing and fish consumption in Mexico. It is a trust fund administered by the Cooperative Development Bank.

The plant's opening indicates the Government campaign is serious, and that the experience gained in the border town may be useful to similar branches elsewhere in Mexico. The address: Callejon Progreso 108. ("Mexico Industrial," March 6, 1967.)

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SPINY LOBSTER SEASON BREAKS RECORD

The 1966/67 lobster season in Baja California that ended March 15 broke all records, according to preliminary figures of the Ensenada office, Mexican Bureau of Fisheries.

Nine of the 10 producing cooperative fishermen's associations reported significant increases in catches over last season's banner output. Also, losses due to mortality during handling and shipping decreased. The single licensed processing plant at Ensenada packed and exported 2,652,667 pounds of spiny lobsters during the 1966/67 season, compared to 2,014,131 pounds of the previous year. The total 1966/67 catch was 2,788,574 pounds, of which 134,542 pounds could not be

Mexico (Contd.):

packed because of mortality (only lobsters that arrive at the plant alive may be cooked.

Nearly All Exported to U. S.

Virtually all production is exported to the U. S. Fishery authorities believe catches could be increased in Baja California by introducing deep-water fishing gear and new techniques. Although Baja California has had nearly a monopoly on Mexican spiny lobster production, the Gulf and Caribbean coasts of the Yucatan Peninsula have produced greatly increased catches in the last 2 or 3 years. Also, private and government groups have begun to explore along the Pacific Coast south of the Gulf of California, an area previously exploited only slightly for the local market. Altogether, Mexico may become increasingly important as a supplier of spiny lobsters to the U. S. market. (U. S. Embassy, Mexico, March 30, 1967.)

Brazil

HAS NEW BASIC FISHING LAW

Brazil's new basic fishing law (No. 221, February 28) revokes the restrictive 1938 Fishing Code. It gives the green light to foreign investors to develop the fishing industry.

Two articles have major significance for potential investors and are expected to stimulate strongly the development of the industry: Article 6--removes the restriction on foreign vessel operations in Brazilian waters if they are properly registered and authorized; Article 8--extends ownership registration of fishing vessels (formerly limited to Brazilians) to companies organized in Brazil, if they comply with registration requirements. However, in accordance with the Brazilian Constitution, the new law requires that two-thirds of the crews must continue to be Brazilian.

Development of a modern well-equipped fleet should be accelerated by the measure's tax exemptions. Firms with fishery projects approved by SUDEPE (Superintendency for Development of Fisheries) are exempt from the import tax and the Tax on Industrialization of Products up to fiscal 1972 on imports of fishing vessels and equipment not available in Brazil. Fiscal year is equivalent to calendar year. Manufacturers of fishing equipment also are exempted.

Also, exemption from federal taxes or charges is granted to 1972 on fish taken in Brazilian waters and intended for domestic use or export.

Provides Incentives to Invest

Three kinds of investment incentives are provided: 1) This applies to fishing companies with plans approved by SUDEPE. They will receive 100-percent exemption from income taxes and surtaxes up to 1972--provided that the exemption value is incorporated into the company's capital. Stocks, quotas, and shares of capital received from this capitalization also are exempt from income tax.

2) Applies to any corporate body registered in Brazil. Brazilian firms may deduct from income tax and surtaxes up to 1972 a maximum of 25 percent for investment in fisheries projects that SUDEPE declares useful to industry development. Such projects include capture and processing of fish--and their transportation and marketing. Companies receiving tax benefits must invest one-third of it. The deductions may be applied to more than one project, but they may not exceed in one year 50 percent of the firm's income tax and surtaxes.

3) Applies to expenses incurred in SUDEPE-approved resource research and to donations to nonprofit institutions for conducting SUDEPE-approved programs of technical education and resources research. Firms may deduct these operational expenses; individuals may deduct them up to 50 percent of gross income.

Seeks More Efficient Industry

The law aims to make the existing industry more efficient. The government will stimulate the creation of cooperatives in fishing villages, Fishermen's Colonies, and fish distribution centers in principal cities on the coast or on rivers. Fishermen's Colonies and other organizations also are to be reorganized and regulated by the government.

Regulations to implement the law are expected to be issued within a few months. (U. S. Embassy, Rio de Janeiro, March 14, 1967.)

Argentina

REACTS TO SOVIET FISHING ON PATAGONIAN SHELF

In early 1966, the Soviet Union established a Fishing Fleet Command at Havana, Cuba, to exploit the southwest Atlantic fishing grounds. During the late summer, many Soviet vessels from the Northwest Atlantic were seen moving southward: first into the Caribbean and the Gulf of Mexico and, last, along the Brazilian coast towards the tip of South America.

On Sept. 30, 1966, the Argentine Navy stopped and searched two Soviet and one East German fishing vessels off Buenos Aires Province. The vessels were not detained; the reasons for the boarding are not known. The East German vessel was probably the research ship "Ernest Haeckel." Other Soviet vessels were sighted by the Argentines in mid-October and early November 1966, but no action was taken.

On Nov. 18, 1966, a reporter for the Bahia Blanca (city south of Buenos Aires) newspaper "La Nueva Provincia" flew with a Navy pilot on surveillance from Nueva Espora Naval Air Base. Twenty-two Soviet vessels were sighted and photographed. They were in 2 groups: one of 5 vessels at 40° S. and 61°40' W., or about 25 miles off Argentina's coast just NNE. of Isla De Los Riachos. One vessel was a mothership "larger than the biggest Argentine destroyers." The second group of 15 vessels was 30 to 80 miles off the city of Bahia San Blas. The San Blas region is one of the most important fishing centers. Most Soviet vessels in that group were identified as large stern factory trawlers of the "Maiakovskii" or "Tropik" classes. Two other Soviet vessels were sighted near the two main groups. No Soviet vessel was sighted within 12 miles of the coast.

Argentina Protests

Soon afterward, the Argentine Ministry of Foreign Affairs protested to Soviet Ambassador Volskii. The Under Secretary of Foreign Affairs, J. A. Mazzinghi, later told the press that he had informed the Ambassador of the "Argentine position concerning the fishing problem," which directly affects the nation's economy.

In early Dec. 1966, military planes and private vessels sighted Soviet vessels off Necochea, the Valdez Peninsula, and elsewhere. The sightings were extensively reported in the press.

Finally, Argentina's fishing industry became concerned. On Dec. 12, 1966, the press reported: (1) fishermen accused the Soviets of using explosives in mass killings of fish. (2) Cuban and Yugoslav vessels and a "large" Japanese fleet were in the area. (3) Mar del Plata fishermen threatened to strike to protest the government's "lack of concern" over foreign fishing. (4) The fishing industry feared depletion of resources within 60 days and wanted extension of territorial limits to 200 miles.

The Japanese fleet probably consisted of about 70 tuna vessels, which had been reported fishing off Brazil in mid-December. The Yugoslavs recently began tuna fishing with 3 vessels in the southeastern Atlantic and may have entered the southwestern Atlantic. Cubans, who recently purchased 20 tuna vessels from Spain, reportedly planned to use them in the south Atlantic. It is doubtful that the Soviet fishermen would use explosives for fishing but it is conceivable that some Soviet or East German research vessel may have used explosive charges in its research.

The U. S. Embassy at Buenos Aires reported, Jan. 4, 1967, that Argentina had adopted a 200-mile maritime jurisdiction.

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SOVIET RESEARCH SUB REPORTED OFF ARGENTINA

A "mysterious" submarine, allegedly Soviet, was reported in Argentine waters on March 11, 1967. It was on the Patagonian Shelf, where Soviet fishing fleets were recently sighted. One Argentine interpretation for the sub's presence was that it will defend the Soviet fleet (about 48 vessels) from possible attack.

Most likely, however, it is the research submarine "Severianka," of the Polar Scientific Research Institute for Fisheries and Oceanography (PINRO) of Murmansk. A few months ago, it was reported off South-West Africa engaged in fishery research. It is likely she crossed the Atlantic to operate off Argentina.

* * *

Argentina (Contd.):

HAS NEW EXPORT TAX LAW

Argentine Law No. 17,198, March 13, 1967, establishes ad valorem (in proportion to the value) export taxes for most major export commodities. All of the following have a 16 percent rate: fish and shellfish, without exception, and including fish and marine mammal fats and oils (including refined); whale sperm and sperm of other cetaceae (spermaceti) in the rough state, pressed or refined, including artificially colored; products prepared from fish and shellfish; shellfish and fish meals and powders. (U. S. Embassy, Buenos Aires, April 12, 1967.)

Cuba

FISHES OFF ARGENTINA

On Sept. 10, 1966, the Cuban stern trawler "Biajaiba" left Havana for a 71-day fishing trip off the South American coasts. The 1,113-gross-ton vessel, built at Vigo, Spain, traveled 6,000 miles to 75 miles off Argentina's coast between Quequen and Punta San Blas (40°20' S.).

The live-weight catch was 648 metric tons, 621 tons of which (95.8 percent) were southwest Atlantic hake. About 481 tons (77.5 percent) of the hake consisted of fish averaging 35 centimeters (almost 14 inches). The rest of the live-weight catch (27 tons) was large squid and an unidentified species (25 cm. or almost 10 inches long called in Spanish "salema").

The trawler fished only 26 days (Oct. 14 to Nov. 9); the rest of the time (45 days) was spent traveling to and from the grounds. The average daily catch was about 25 metric tons or about 455 kilograms (1,000 pounds) per crew member of 55 (9 Soviets, including the captain, Ivan Zainukov, and 46 Cubans). The finished product was 450 metric tons of frozen fish. Since the vessel's freezing equipment could not process more than 17.3 metric tons of raw fish a day, only the best fish were frozen. (The rest, or close to 200 tons, was probably discarded.)

The hake were caught in waters 60-75 meters (197-246 feet) deep and having a temperature of from 10° to 11° C. (50° to 51.8° F.). The Biajaiba was serviced by the Soviet fleet off Argentina. ("Granma," Dec. 25, 1966.)

Another Cuban vessel, the "Guasa" (also built in Spain and Biajaiba's sistership (also was reported fishing for hake in the same southwest Atlantic area. Soviet hake operations in that area are probably similar. Many of Biajaiba's fishermen are extremely young (17 and up); the third officer, a veteran of 5 years in the Cuban fishing fleet, is only 18.

Guatemala

CATCHING SHRIMP IS MAJOR PART OF FISHING INDUSTRY

A new BCF leaflet states that Guatemala has a coastline of 402 kilometers--255 on the Pacific Ocean, the remainder on the Atlantic. The major share of her fishing industry is devoted to catching shrimp, although some finfish and other crustaceans and mollusks are caught for commercial use. At the present time, shrimp fishermen are forced to throw back roughly 5-10 pounds of fish for each pound of shrimp caught, according to Government estimates, because there are no facilities for processing the fish. More fish processing facilities must be constructed and a larger fishing fleet acquired, the latter presumably by private investment. The leaflet includes tables on recent and projected fish catches, exports, and local consumption.

Note: FFL-111--"Exploitation of Marine Resources in Guatemala," is available free from the Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.

EUROPE

USSR

REPORTS 1966 PACIFIC RESEARCH AND 1967 PLANS

In early March 1967, the Scientific Council of the Pacific Scientific Research Institute for Fisheries and Oceanography (TINRO) held its annual session. Thirty-eight scientists from TINRO and its 4 affiliated Institutes reported on 1966 fishery research and plans for 1967 scientific investigations. Also present were delegates from the All-Union (Federal) Scientific Research Institute for Fisheries and Oceanography (VNIRO) in Moscow, biologists and technologists from the Vladivostok University, and scientists from the Vladivostok Branch of the USSR Academy of Sciences.

In 1966, 26 of TINRO's fleet of over 50 fishery research vessels were engaged in distant-water research spanning the entire Northern Pacific and reaching as far south as New Zealand and Australia. Fisheries research was concentrated in the Japan, Okhotsk, and Bering Seas; the North Pacific Ocean off the Canadian, U. S., and Mexican shores; the New Zealand Plateau and the Great Australian Bight with adjacent areas; and the Indian Ocean. There also were some studies of the fishery resources off southeast Latin America. TINRO employs over 300 scientists.

TINRO's discoveries of new fishery resources made it possible for the Soviet Far Eastern Fishing Fleet to expand operations into the waters off British Columbia, Oregon, and Washington, Baja California, and into the southern Pacific and Indian Ocean. Off the U. S. Northwest Pacific coast alone, Soviet fishermen landed over 130,000 metric tons of Pacific hake and about 10,000 tons of Pacific ocean perch and other rockfish.

Problems for Technologists

In 1966, catches of previously not-fished-for species posed many problems to TINRO's fishery technologists. New methods had to be worked out to process Pacific hake, tuna, swordfish, and other pelagic species. In 1967, the Far Eastern technologists are again faced with the task of developing processing techniques for new species of fish the Soviets expect to catch--North American and Southeastern Pacific types of mackerel-pike (saury), anchovy, shark, mackerel, and others.

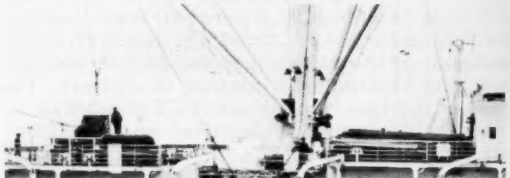
To increase landings, the Fishing Gear Laboratory of TINRO developed a new 25-meter (81-foot) wide trawl. The standard Soviet trawl is 31.2 meters, or 101 feet, wide. The new trawl was used experimentally in midwater trawling by the large stern trawlers "Mgachi" and "Baikal" with excellent results: catches were 2 to 3 times greater than those made with the standard trawl. There was no difference in catches when new and standard trawls were used for bottom fishing.

Other matters discussed at the annual session were Pacific resources of squids, mussels, and scallops; marine algae; the effect of tree-felling on natural reproduction of salmon; introduction of purse seining in Pacific herring fishing; potential for future increased landings from the Pacific and Indian Oceans.

* * *

FISH AND CAN SHRIMP OFF ALASKA'S SHUMAGIN ISLANDS

During a fisheries patrol by the U.S. Coast Guard cutter "Confidence," on December 30, 1966, a cutter officer and a BCF Resource Management agent visited the Soviet floating shrimp cannery "Vasilii Putintsev" anchored off Nagai Island in the Shumagin Islands.



The 12,700-gross-ton Soviet floating cannery Vasilii Putintsev is used to process small shrimp landed off Shumagin Islands by about 20 medium (700 gross tons) freezer trawlers, class SRTM-Maiak. (Photo: James H. Branson, BCF Resource Management Agent.)

The Putintsev had arrived off Alaska that month to service 20 medium freezer trawlers shrimping off the Shumagins. She is like 14 other "Zakharov"-class canning factoryships operating in the Pacific--12,700 gross tons,

USSR (Contd.):

520 feet long, sea endurance of 9-10 months, and a crew of over 600 (500 are processing workers). The Zakharov-class vessels are used primarily in North Pacific king crab, saury, and herring fisheries.

The captain of the Soviet cannery told the Americans that she would remain in the Shumagin area until early March 1967, then enter the king crab fishery off Kamchatka.

How Shrimp Are Handled

During a tour of the Putintsev, the Americans observed:

The shrimp are hoisted aboard from medium freezer trawlers in large, apparently wooden containers, about 4 by 4 by 4 feet. There is a way of emptying these boxes through the bottom or lower side without tipping them.

Then the shrimp are placed in 10-kilogram mesh bags, which go through a continuous blancher on a conveyor belt and receive a 5-minute cook. The bags of shrimp are then routed down another continuous belt into the main deck compartment, where the shrimp are dumped and placed on one of many large stainless steel tables for hand picking. Only pink shrimp (P. borealis) were seen on the peeling tables. There was hardly any "trash" mixed with the shrimp--probably because they had been sorted at least once between receiving and bagging.

This main-deck working compartment is 150 feet long and the ship's full width, except for rather narrow weather deck spaces on either side. The workers were lined shoulder to shoulder at the tables; there must have been 100-150 people hand peeling shrimp.

The shrimp meats are peeled into large square metal pans. When a pan is filled, it is taken to an elevator at the after end of this compartment and sent down to the next lower deck.

Shrimp Meats Washed

The pans are dumped on long tables with conveyor belts running down the middle. The meats are washed with sea water and the odds and ends of shell, etc., removed by other workers. The washed meats are put in small plastic trays. These trays are then weighed and the exact amount of shrimp needed to fill a can added or subtracted. Then they are passed to other workers, who place the meats in parchment-lined quarter-pound flat cans. The cans are routed through the usual canning machinery (all Japanese made), and retorted. When taken from retorts, canned shrimp are packed in stout, 72-can wooden cases.

Most of this fishery seems to take place at night. Many boats tied up during the day are waiting to deliver to the factoryship.

* * *

INCREASES SHRIMP CATCHES OFF ALASKA

Soviet catches of shrimp in the Shumagin Islands area in the Gulf of Alaska during January-February 1967 were much greater than during the same period last year. About 20 medium trawlers had caught an estimated 5,000 metric tons by the end of February. In early February, the fleet caught on the average up to 120 tons a day--an average daily catch of 6 tons (13,000 pounds) per trawler. Shrimp are delivered to the "Zakharov-"class canning factoryship "Vasilii Putintsev" for canning, presumably for domestic markets.

In 1966, the Shumagin Islands area yielded 10,600 metric tons of shrimp; 6,517 tons were exported to Japan.

* * *

CONDUCTS FISHERY RESEARCH OFF WESTERN SOUTH AMERICA

In early February 1967, the Pacific Scientific Institute for Fisheries and Oceanography (TINRO) reportedly sent 2 fishery research vessels on an exploratory cruise off Western South America. During a 6-month research period, TINRO scientists will study the commercial fishing potential of Southern Pacific pike-mackerel (saury).

The development of saury fishing in the southeastern Pacific off Chile and Peru during winter months would make it possible for the Soviets to continue using the specialized vessels that fish for saury in the northwestern Pacific (off Japan and Kuril Islands) during summer months.

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USSR (Contd.):

HAS FISHING NET FACTORIES

The Soviet fishing-net plant at Klajpeda in Lithuania is scheduled to produce about 100,000 nets this year. Only 20 percent of them will be made of synthetic materials; the rest of cotton. Most of the nets are probably drift nets.

Also, the plant will produce 1,200 trawl nets and 10 purse seines, the latter 610 meters (1,830 feet) long, 120 meters high and weighing 9-12 metric tons (depending on materials used). The nets are used primarily by Lithuanian fishermen, but some are exported to Cuba, Guinea, and Yemen.

Another Soviet net factory, located at Nakhodka in the Far East, manufactured about 700 trawl nets, mostly synthetic, during 1966.

* * *

"OKEANOLOGIIA" REVIEWS SECOND INTERNATIONAL OCEANOGRAPHIC CONGRESS

The November-December 1966 issue of the Soviet oceanographic journal "Okeanologiia" contains 6 articles by Soviet authors reviewing the Second International Oceanographic Congress held in Moscow in June 1966. The fields reviewed are: physical oceanography, regional oceanography, marine chemistry, biological oceanography, tectonics, and geomorphology. The Soviet authors are: Belousov, Kitaigorodskii, Burkov, Chigirin Beklemishev, et at., and Zhivago.

Poland

WILL BUILD OCEANOGRAPHIC VESSELS FOR USSR

The Soviets contracted with a Szczecin shipyard on Nov. 2, 1966, for the delivery of 9 oceanographic research vessels of the B-88 class. The 2,500-gross-ton vessels will be 97 meters (318 feet) long, 14 meters (46 feet) wide, and have a diesel motor of 2,400 hp. ("Budownictwo Okretowe," Jan. 1967.)

Norway

OUTLOOK FOR WINTER HERRING FISHERY REPORTED GOOD

A scientist of the Norwegian Institute of Marine Research said in a recent interview that the vessel "Johan Hjort" had taken larger quantities of winter herring on a recent cruise off Norway's West Coast than had been seen for many years. Schools a quarter of a mile long and 100 meters deep were found. If weather continues good, prospects are excellent for winter herring catches exceeding 450,000 metric tons. Fish of the 1959 and 1960 year-classes will be prevalent in the stocks this year, but there will also be fish of the 1961 year-class. The herring caught this year will be only average size. Unfortunately, the younger year-classes are not abundant and the stocks are expected to decline in 1968. This will result from natural conditions, not from the heavy fishing expected. ("Fiskaren," Feb. 8, 1967.)

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CANNERS OF SILD HERRING HAD GOOD YEAR IN 1966

Norwegian canners of sild sardines had a good year in 1966. They produced 1.5 million cases, the best pack in recent years. The pack of brisling also was good. Production of small sild in early 1967 should be good because there are sizable frozen stocks in storage.

Despite the large final pack of sild sardines, exports declined in 1966 because of supply shortage early in the year. The decline was partially offset by higher exports of brisling. Canned exports of kippered herring and soft herring roe also rose in 1966.

Exports of Principal Canned Fishery Products, 1965-1966

Product	1966	1965
	(Cases of 100 $\frac{1}{4}$ cans)	
Brisling	440,000	391,000
Sild sardine	811,000	925,000
Kippered herring	265,000	257,000
Soft herring roe	84,000	59,000

U. S. Is Principal Market

The principal market for Norwegian canned fishery products is the U. S., which bought 10,269 metric tons as of November 30, 1966, compared to 10,321 tons in the 1965 period. Shipments to other leading buyers in the first

Norway (Contd.):

11 months of 1966 (comparative data for 1965 in parentheses) were: United Kingdom 6,788 tons (5,282 tons); Australia 1,678 tons (1,758 tons); South Africa 1,077 tons (1,335 tons); and Canada 942 tons (966 tons). ("Norwegian Canners Export Journal," Feb. 1967.)

Iceland

PRICES FALL AND
FOREIGN MARKETS ARE UNCERTAIN

Iceland's 1966 catch was estimated at a record 1,240,000 metric tons: herring, 775,000 tons (763,000 tons in 1965), capelin, 125,000 tons (50,000 tons in 1965), and crustacea (lobster and shrimp) 5,000 tons (same as 1965). More herring and capelin were caught in 1966 because more vessels fished for them.

At the beginning of 1967, there were 184 herring vessels over 100 gross registered tons (GRT). The average size was 193 GRT. Thirty-seven new ones (average size 318 GRT) will be built during 1967. But small vessels (under 100 GRT) decreased from 648 in 1964 to 577 at the beginning of 1967. Of 32 registered trawlers (700 to 1,000 GRT), only 20 are being operated.

Frozen Fish Production Drops

Frozen fish production was about 85,000 tons in 1966, a 15-percent drop from 1965, when only 19 percent of freezing-plant capacity was used. The 2 largest freezing-plant firms, Federation of Cooperative Societies and Freezing Plants Corporation, account for over 90 percent of total output. They produced an estimated 49,000 tons of frozen cod fillets and blocks in 1966 (55,000 tons in 1965), 22,000 tons of frozen herring (27,000 tons in 1965), and 8,000 tons of animal food (9,000 tons in 1965). About the only encouraging development for the freezing industry in 1966 was the favorable Soviet market. Sales to the USSR were 12,500 tons (9,900 tons in 1965), up 26.3 percent. The U. S. market absorbed 27,200 tons in 1966 against 28,200 tons in 1965, down 3.6 percent.

Fish meal production in 1966 is estimated at 178,000 tons (174,000 tons in 1965). Of this, herring meal was about 135,000 tons, cod meal 19,000 tons, and capelin 19,000 tons; the remaining 5,000 tons were ocean perch and other species.

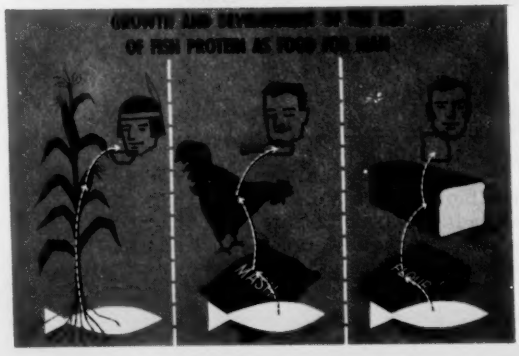
An estimated 107,000 tons of fish oil were produced in 1966--herring oil was 97,000 tons, cod-liver oil just over 6,000 tons, and the remaining 4,000 tons were capelin and whale oil.

Problems for Industry

The most serious problems facing the fisheries are the fall in prices and the uncertain foreign market for major exports.

The changes in the composition of the catch have produced severe bottlenecks, especially for freezing plants because the biggest share of the cod catch of the small vessels is landed between February and April. This results in great underutilization of capacity in other months. The cutback in fishing by large trawlers has compounded this difficulty. Groundfish fishermen recently were given more government subsidy for exvessel prices. But these fishermen have asked for more help.

Two recently proposed parliament bills would influence further fisheries developments. One seeks to provide partial compensation for any decreases in world market prices below end-1966 levels. The other bill calls for founding a fisheries council to coordinate the entire industry--and to conduct market research and development for fish products abroad. (U. S. Embassy, Reykjavik, March 16, 1967.)



Greenland

CONCERNED OVER LOW PRICES
FOR SEAL SKINS AND COD

During the past year, Greenland has faced declining prices for seal skins and market problems for frozen cod fillets. The impact is felt primarily in the hunting districts of Northwest and Eastern Greenland, where prices to the seal hunter have dropped 42 percent.

Segments of Greenland's native population may face a bleak future if markets for seal skins and frozen cod fillets remain weak--and if cod catches drop, as fishery biologists predict. ("Berlingske Tidende," Feb. 20, 1967.)

United Kingdom

WORLD FISHING EXHIBITION
OPENS IN JUNE

The British periodical "World Fishing" is sponsoring a World Fishing Exhibition at National Hall, Olympia, London, June 1-7, 1967. It will be opened by Food and Agriculture Organization Director-General B. R. Sen, accompanied by FAO Assistant Director-General (Fisheries) Roy Jackson.

The 1967 Exhibition will feature the latest technological developments in fishing vessel design, marine engines (main and auxiliary), fishing gear, nets, deck machinery, marine electronics and fish-finding equipment, refrigeration, ice-making and processing equipment, and services. Exhibits from 15 countries will be displayed.

Vessel Display at Fish Dock

A new feature this year will be the Olympia Fish Dock--a display of stern trawlers, multipurpose vessels, fast lobster boats, and a new fishing catamaran.

On June 2 and 3, a nontechnical shellfisheries meeting will take place at Olympia along with the exhibition. The aim is to show how efficiency in shellfisheries can be improved by better gear and better marketing.

Admission is by invitation ticket only. Requests for tickets and information to: Commercial Exhibitions, Ltd., The Tower, 229-243 Shepherds Bush Road, Hammersmith, London, W6, England.

* * *

ISSUES PROGRESS REPORT
ON BOXING FISH AT SEA

The British White Fish Authority, sponsor of extended tests of boxing fish in ice at sea aboard a middle- and a distant-water trawler, has issued a 19-page, illustrated progress report. It states: boxing fish at sea, properly done, improves quality; and further improvements are obtained if boxed fish are landed and offered for sale without being disturbed--because this eliminates damage from hooks and shovels and the fish are protected by ice while awaiting sale. Boxing at sea also could facilitate the techniques of transferring fish at sea or of superchilling.

Alloy Metal Box Used

A light alloy metal box, easily cleaned, was used in the tests. The box was $32\frac{3}{4} \times 10\frac{1}{4} \times 15$ inches, internal volume 4,800 cubic inches, and holding about 150 pounds. It was considered important for it to be no deeper than 12 inches to avoid crushing the fish on the bottom--and to have drainage (drain holes were set in side gulleys). Circular pressings force the boxes apart $\frac{3}{8}$ inch in stowage to prevent pockets of liquid from collecting. The boxes could be nested when empty.

The tests were supervised by the Authority's Industrial Development Unit, Southside, St. Andrew's Dock, Hull, England.

* * *

FISHERY LOAN
INTEREST RATES REVISED

The British White Fish Authority has announced that its rates of interest on loans made from February 4, 1967, will be:

For fishing vessels of not more than 140 feet, new engines, nets and gear: on loans for not more than 5 years, $7\frac{3}{8}$ percent (decrease $\frac{1}{4}$ percent); on loans for more than 5 years but not more than 10 years, $7\frac{1}{4}$ percent (decrease $\frac{1}{8}$ percent); on loans for more than 10 years but not more than 15 years, $7\frac{1}{4}$ percent (de-

United Kingdom (Contd.):

crease $\frac{1}{8}$ percent); on loans for more than 15 years but not more than 20 years, $7\frac{1}{4}$ percent (no change).

The rate for processing plants on loans for not more than 20 years was unchanged at $7\frac{3}{4}$ percent.

The rates on loans made before February 4 were unchanged. ("Fish Trades Gazette," Feb. 11, 1967.)

Portugal

TUNA FIRM EXPANDS AT CAPE VERDE ISLANDS

The Portuguese firm that operates cold-storage facilities at Mindelo on Sao Vincente plans to order four 127-foot purse-seiners from a West German firm. Delivery is expected in 1968. The Portuguese Ministry of Finance is expected to guarantee a loan equivalent to US$2.6 million to finance the purchase. With the new vessels, the firm expects to increase its annual tuna catch from 600 to 8,000 metric tons; most would be sold to foreign canners. The firm also wants to expand Sao Vincente as a base for foreign fleets by increasing its cold-storage capacity.

The company now has 2,500 tons of frozen storage capacity at Mindelo, most of it newly inaugurated. Forty percent of this is currently being rented to Japanese and Panamanian flag tuna vessels using Sao Vincente as their home base and selling their catch largely to U. S. packers. The remaining 60 percent is available to the new Portuguese vessels under construction and to the expansion of rental facilities to foreign fleets.

Should the Portuguese company's experience with the 4 vessels prove financially successful, it will seek more government guarantees to finance the purchase of 6 more purse-seiners. If future experience justifies it, the company may increase the refrigeration capacity of its present plant to 3,500 tons. If Sao Vincente is used more by foreign tuna fleets, the firm may construct a new 3,500-ton refrigerated storage plant on the docks at Mindelo. The present facilities are located 800 yards from the waterfront. (U. S. Embassy, Lisbon, March 6, 1967.)

Greece

1966 CATCH WAS UP SLIGHTLY

The Greek catch in 1966 was estimated at 108,100 metric tons (up 1.4 percent from 1965). Of that total, 29,600 tons (up 9.2 percent) came from deep-sea waters, mainly the Atlantic; 66,500 tons (down 6.3 percent) from Greek and Mediterranean waters; and 12,000 tons (up 41.6 percent) were taken from inland waters.

Five vessels were added to the deep-sea fleet during 1966. Ten more are expected to be added this year.

A company was set up in February 1967 by the Hellenic Industrial Development Bank (ETVA), a quasigovernmental financial institution, to organize the production and marketing of the deep-sea catch.

Fishing in the Mediterranean was generally poor and resulted in the 6.3-percent catch decline. The increased production of fish in inland waters was achieved with the aid of a program sponsored by the Greek Government. Under it, rivers and lakes were stocked with fast-growing species, particularly trout. (U. S. Embassy, Athens, March 16, 1967.)

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ATLANTIC FREEZER FLEET INCREASES

The Greek freezer trawler fleet, 37 vessels at end of 1966, landed 29,582 metric tons of frozen fish in 1966, compared with 27,073 tons in 1965 and 21,039 tons in 1964. The vessels fish in the Atlantic off Africa's Northwest Coast.

Although total catches have increased as fleet expanded, the average annual catch per vessel has dropped from 1,095 tons in 1962 to 954 tons in 1966. Wholesale prices at point of first sale for frozen fish averaged $394 a ton in 1966, compared with $383 a ton in 1965. ("Alieia Fishing," Jan. 1967.)

Cleaning salmon. (Photo: USIA/National Archives)

ASIA

Japan

FISHERIES AGENCY BUDGET IS UP FOR FY 1967

The Japanese Government has adopted the budget for fiscal year 1967 (April 1967-March 1968). Estimates for the Fisheries Agency, Ministry of Agriculture and Forestry, total 26,597 million yen (US$73.9 million), up about $6.6 million, or 9.74 percent, over FY 1966's $67.3 million.

Funding for some proposed FY 1967 programs:

Program	FY 1967 Proposed Budget		FY 1966 Regular Budget	
	Yen	US$	Yen	US$
	(1 Million)			
Fishing port improvement	13,465	37.40	11,379	31.61
Fishery technological improvement	1,013	2.81	933	2.59
Overseas fisheries development	586	1.63	424	1.18
Marine resources cultivation and conservation	509	1.41	484	1.34
Fishery products processing & marketing improvement	367	1.02	351	0.97
Fishery cooperatives consolidation	30	0.08	-	-

New Wireless System Proposed

The budget provides for the "fishery technological improvement" program a new wireless communication system to forecast hydrographic and fishing conditions. This system will be added to existing facsimile and radio communication systems.

The "overseas fisheries development" program includes operation of the new government research vessel (scheduled for completion this fall) in exploratory purse-seine fishing off New Zealand. The results will determine the extent to which the government will license the operation of high-seas purse-seine vessels in the future.

The only new program proposed for FY 1967 is the consolidation of the Nation's 1,400 fishery cooperatives in 4 years to improve their administration. ("Suisan Keizai Shimbun," March 2, 1967.)

* * *

TUNA PACKERS SET BY 1967 EXPORT RULES

The Japan Tuna Packers Association adopted on March 8 these regulations governing canned tuna exports for business year (BY) 1967 (April 1967-March 1968):

1. Quantity making up one case: Tuna packed in 7-oz. 48s, 13-oz. 24s, and 66½-oz. 6s will count as one case. 3½-oz. 48s will comprise half a case.

2. Sales restrictions:

   a. Canned tuna in brine (excluding grade "B" packs) for export to the U.S. will be consigned to Canned Tuna Sales Co.

   b. Grade "A" canned tuna packed in brine will be sold for export only to U.S.

   c. Grade "B" canned tuna packed in brine or oil will not be sold for export to U. S.

   d. Canned tuna not packed in brine or oil, but subject to U. S. import tariffs applicable to canned tuna in brine and oil, will not be sold for export to U. S.

   e. Exports of canned tuna not consigned to the Sales Co. must be approved by Japan Tuna Packers Association.

3. The BY 1967 quota of canned tuna in brine for export to the U. S. has been set at 2.6 million cases--an increase of 100,000 cases from BY 1966. About 2.34 million cases will be allocated to exporters on past performance records, and 260,000 cases were unassigned. The unassigned quota will be allocated to exporters who have used up their quotas: During each 6-month period, 130,000 cases will be offered on a first-come basis; not more than 4,000 cases will be sold per Association member.

4. Price restrictions: Canned tuna consigned to the Sales Co. will not be sold below the following Association-set minimum prices.

Japan (Contd.):

Classification	Can Size	Price Per Case	
		Yen	US$
White meat solid	13-oz. 24s	2,970	8.25
" " "	7-oz. 48s	3,200	8.89
" " "	3½-oz. 48s	1,860	5.17
" " "	66½-oz. 6s	3,420	9.50
White meat flake	7-oz. 48s	2,330	6.47
Light meat solid	13-oz. 24s	2,330	6.47
" " "	7-oz. 48s	2,380	6.61
" " "	3½-oz. 48s	1,460	4.06
" " "	66½-oz. 6s	2,850	7.92

Source: "Suisancho Nippo," March 9, 1967.

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EXPORTS OF FISHERY PRODUCTS ROSE 9.5% IN 1966

Exports of fishery products from Japan in 1966 totaled $362 million--an increase of 9.5 percent over 1965, reports the Japanese Export Trade Organization (JETRO). However, this was only 3.7 percent of total exports of $9,776.34 million (15.7 percent more than 1965). Exports of marine products are becoming less important each year. The reason: Exports of heavy industry goods remain high, but the production of marine products cannot keep pace with increased domestic demand; it is becoming more difficult to obtain raw fish for export. Also, international regulations of resources are becoming more restrictive, and domestic production of fish in developing countries is increasing.

Japan's Exports of Marine Products for 1966

	1966	1965
	. . . .(US$1,000)	
Fresh and frozen products: . . .	118,171	88,837
Fish	106,697	76,082
Crustacea and molluscs . . .	8,507	6,560
Others	2,967	6,195
Salted or dried products: . . .	8,033	6,118
Fish	1,699	1,448
Crustacea and molluscs . . .	2,359	1,622
Others	3,975	3,048
Canned and bottled products .	142,118	138,499
Fish and whale oil	12,936	20,916
Pearls	64,697	64,217
Other marine products	16,096	11,961
Grand total	362,051	330,548

Exports of frozen tuna totaled 177,606 tons worth $81,622,000--an increase of 56 percent over 1965. Significantly, the price of albacore fell sharply last summer due to oversupply, but it recovered completely and remained high through 1966. Also, the high price of lightmeat tuna for Italy and other European markets was maintained because of the general poor catch.

Exports of frozen broadbill swordfish were almost the same as 1965--7,194 tons valued at $6,272,000, up 1 percent. This shortage of local supply was due primarily to a poor catch in U.S and Canadian waters.

Exports of sea bream and squid taken by trawl in the Atlantic Ocean decreased because of a poor catch--despite more fishing boats. Also, Greece, Italy, and other major markets limited import of those species. Exports of frozen salmon and whale meat decreased 49.5 percent due to international restrictions on catch and increased domestic demand.

Exports of frozen shrimp increased 69.4 percent-2,477 tons in quantity and $5,170,000 in value. The reason: British consumer preference for high-quality shrimp.

The production of dried or salted marine products decreased because of reduced catch by coastal fisheries. But increasing were exports of boiled and dried fish ("katsuobushi," etc.) for the Ryukyus, shark fin for Hong Kong and Singapore, abalone for Hong Kong, and dried kelp ("kombu") for Southeast Asia.

Exports of canned salmon totaled 1,803,000 cases worth $38,240,000--down 37.3 percent. The reason: international restriction on catch and an increased production of canned pink salmon in Canada, the major competitor of the U. S. in salmon export.

Canned Tuna Exports Soared

Exports of canned tuna, a leading commodity, increased 33.1 percent (5,281,000 cases at $47,559,000). Although export of canned tuna in water to the U. S. was rather poor because of high price in first half, the market improved during the second half. Exports of canned tuna in oil and seasoned tuna increased appreciably.

Among the bluefish (canned mackerel, saury, sardine, and horse mackerel), exports of canned mackerel nearly doubled (99.7 percent). The 1965 total was 3,589,000 cases worth $18,232,000.

Exports of finback whale oil to Europe decreased sharply due to increased regulations of Antarctic whale catch and reduction in land-based whaling. The export of sperm oil to the

Japan (Contd.):

U.S. was not active because of the short supply. So, export of whale oil decreased 39.6 percent from 1965--54,469 tons at $12,241,000.

The export of pearls, which has grown rapidly in past 4-5 years, did not increase significantly in 1966 because of delivery delays at year's end, a price rise for some sizes, and adoption of tougher inspection standards. However, the exports increased 0.7 percent. The total was 91,281 kilograms (92 tons) worth $64,562,000. (Fishery Attaché, U. S. Embassy, Tokyo, March 16, 1967.)

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1966 SHRIMP IMPORTS SET RECORD

Japanese imports of frozen shrimp in 1966 were a record 36,156 metric tons worth 21,630 million yen (US$60.08 million). They rose 72.8 percent in quantity and 67.1 percent in value over 1965's 21,011 tons worth 12,930 million yen ($35.9 million). In value, shrimp accounted for about 40 percent of total fishery imports in 1966.

1966 Shrimp Imports--With Comparisons

Country of Origin	Quantity		Value	
	1966	1965	1966	1965
	(Metric Tons)		(1,000 Yen)1/	
Mainland China	11,768.5	5,874.7	8,154,432	4,065,112
USSR	6,517.6	1,631.7	611,943	119,511
Mexico	4,889.3	5,209.9	4,122,522	3,626,980
Thailand	3,690.6	1,975.7	2,614,026	1,358,540
Hong Kong	3,170.3	2,579.2	2,470,703	1,777,712
India	993.4	850.5	623,200	429,633
South Korea	846.9	1,003.2	371,376	328,084
Sabah (North Borneo)	701.5	337.4	469,824	181,838
Saudi Arabia	840.4	-	280,861	-
Australia	685.1	563.5	616,496	426,232
Others	2,052.8	985.2	1,295,368	623,920
Total	36,156.4	21,011.0	21,630,751	12,937,562

1/360 yen = US$1.

In 1960, 625 tons were imported; in 1962, 3,642 tons. But in 1963, imports began to rise rapidly--jumping to 11,708 tons. The tremendous increase is attributed primarily to growing demand for this high-priced food brought about by increased earnings of Japanese families. ("Minato Shimbun," Feb. 24, "Suisan Keizai Shimbun," Feb. 10, 1967, and other sources.)

* * *

FROZEN TUNA EXPORT PRICES CONTINUE DECLINE

Prices of Japanese frozen tuna for export to the U. S. continued to decline in early March. Buy offers from U. S. packers were coming in at US$470 a short ton c.i.f. for round albacore and $410 a ton for gilled-and-gutted yellowfin for direct shipment to the U. S. In view of this trend, some observers fear that it may be difficult to hold the line at $450 a ton for albacore and $400 for yellowfin.

Japanese circles do not foresee any price improvement so long as yellowfin fishing continues good in the California tuna fishery. They believe also that hasty selling by overseas-based Japanese tuna suppliers is contributing to the decline. ("Suisan Tsushin," March 7, 1967.)

* * *

TUNA FISHING IS GOOD

Japanese tuna vessels in the Pacific, Atlantic, and Indian Oceans in mid-March 1967 had good fishing in all major fishing grounds. In the Pacific, vessels in the Coral and Arafura Seas, where yellowfin and big-eyed fishery was at peak, were catching daily average of 3 metric tons.

In Indian Ocean, catches of yellowfin dropped in the western area, averaging around 2 tons a day; but in eastern part, fishing improved, with landings averaging 3 tons a day. Japanese tuna vessels in that area were reported far outnumbered by vessels of South Korea and Formosa.

In the Atlantic, Japanese long-liners were concentrated near 5° W. longitude and 6° S. latitude off west Africa (about 700 miles south of Ivory Coast) and were catching 3.5-4 tons a day. Portable-boat-carrying motherships there were averaging 14-15 tons a day. ("Katsuo-maguro Tsushin," March 17, 1967.)

* * *

"AUTO-REEL" IN TUNA LONG-LINING IS USED MORE

The "auto-reel" system in handling long-line gear is spreading rapidly in Japan. It was developed jointly as a labor-saving device by Sanmei Trading Company, Hokoku Suisan

Japan (Contd.):

Fishing Company, and the Kanasashi Shipyards. Over 10 tuna long-liners already are using the system successfully. Another dozen vessels are scheduled shortly to adopt it.

The auto-reel pays out and reels in longlines by remote control and automatically regulates the reeling speed. This eliminates the problem of snapping and tangling of lines during setting and retrieving operations. At first, this equipment was considered unsuitable for vessels under 300 gross tons, but the Kanasashi Shipyards late last year installed it aboard a 250-ton vessel with good results. The Sanmei Trading Company is the sole sales agent for this equipment. ("Suisan Keizai Shimbun," Feb. 21, 1967.)

* * *

JOINT COLD STORAGE ESTABLISHED

The Tokyo Terminal Cold Storage Company, financed jointly by 52 cold-storage firms (including at least 11 fishery firms), was set up on February 28, 1967. The company will rent cold-storage space and handle related business.

Under present plans, cold-storage plants of 10,000-ton capacity will be built, beginning in 1968, at 5 trucking terminals in suburban Tokyo and Yokohama. The owners believe that cold storages will alleviate mounting traffic congestion in central wholesale markets and cold-storage plants in Tokyo. They hope to improve supply and distribution, reduce costs, and stabilize prices.

All major Tokyo fishing firms are participating. The growing domestic demand for frozen fishery products has resulted in about 84 percent of cold-storage space owned by fishery firms being used for fishery products. In earlier years, much of this space was filled with nonfishery products: vegetables, fruits, beef, and ice cream. ("Suisan Keizai Shimbun," March 2 and 3, 1967.)

* * *

REFRIGERATED CARRIER LAUNCHED

The 3,300-gross-ton refrigerated carrier vessel "Seta Maru," ordered by Hoko Suisan Fishing Company's Marine Transportation Division, was launched March 17, 1967, at the Usuki Shipyards in Hiroshima. The vessel is 334.2 feet long, 49.2 feet wide, and 25.6 feet in molded depth. It has a deadweight tonnage of 3,500 tons and is powered by a 5,580-hp. diesel engine giving a service speed of 18 knots. ("Suisan Tsushin," March 31, 1967.)

* * *

PLASTIC FISHING BOAT DEVELOPED

A small, 1½-ton plastic fishing boat manufactured with a new processing method was shown recently in Japan. Made jointly by Mitsubishi Resin Products Research Laboratory, Asahi Fiberglass, and Takeuchi Paint Manufacturing Company, it is 10 meters (32.8 feet) long, of reinforced plastic, and cost (including engine) 1 million yen (US$2,778).

Test runs in Tokyo Bay demonstrated its superiority over wooden boats in speed and riding comfort. Research on plastic vessels also is being conducted by the Japanese Fisheries Agency's Fishing Boat Research Laboratory in collaboration with Hitachi Chemical Industries. ("Suisan Keizai Shimbun," March 7, 1967.)

* * *

IRAQ SEEKS JOINT VENTURE WITH JAPAN

The Japanese Foreign Ministry reportedly received an inquiry from a Baghdad fishery firm seeking Japanese partners for a joint fishing enterprise in Iraq. The proposed venture calls for the operation of 4 fishing vessels, one large processing vessel equipped with a fish meal plant, a cold storage, and a warehouse. The Japanese Government reportedly supports the idea of extending Japan's technical and financial assistance to develop new fishing grounds in the Persian Gulf. ("Minato Shimbun," March 4, 1967.)

* * *

GOVERNMENT APPROVES INVESTMENT IN PERUVIAN FISH MEAL PLANT

The Japanese Government Overseas Investment Liaison Council approved on March 8 Taiyo Fishing Company's planned capital investment in the Peruvian fish meal enterprise operated by Inmarl Company. Taiyo

Japan (Contd.):

will put up 50 percent, or US$233,000, of Inmarl's expanded capitalization of $466,000. It will provide Japanese fishery technicians to improve fishing efficiency. Production target is 40,000 tons of fish meal and 3,200 tons of fish oil annually until 1970.

Taiyo will undertake the marketing of 20,000 tons of fish meal--likely to Europe because Taiyo now does not have an allotment to import fish meal into Japan.

Inmarl Company, a U. S.-owned firm, was established in Lima in 1961. It operates at Cape Atico a plant served by 14 anchoveta purse-seine vessels. Meal production was 20,000 tons in 1965 and 16,000 tons during first-half 1966. ("Suisancho Nippo," March 13, 1967.)

* * *

EXPLORATORY FISHING OFF
U. S. EAST COAST IS REPORTED POOR

The Japanese Taiyo Fishing Company's 369-gross-ton trawler "Taiyo Maru No. 32," exploring for shrimp and sea bream off the U. S. east coast near 35° N. latitude (off North Carolina) reported poor results, as of early March 1. Catch per day of operation averaged 5-6 metric tons of bottomfish, with very small quantities of shrimp and sea bream.

The vessel is exploring the area west of longitude 40° W. (the line running north-south through the middle Atlantic) between latitudes 10° N. and 40° N. (between New York and northern South America). This is part of Taiyo's plans to establish year-round trawl operations in the western Atlantic Ocean. But prospects now are not promising.

In 1963-64, Taiyo conducted experimental fishing in the northwest Atlantic with the converted 3,700-ton trawler "Tenyo Maru No. 3" without success. ("Shin Suisan Shimbun Dokuho," March 3, 1967, and other sources.)

Malaysia

JAPANESE WILL ESTABLISH ANOTHER
TUNA BASE IN PENANG

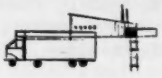
The Japanese trading firm Mitsui Bussan and the Atlantic Tuna Fishery Cooperative Association are planning to establish a tuna base at Penang, Malaysia. They propose to employ temporarily Formosan and Okinawan vessels pending approval of their venture by the Fisheries Agency. Already, they have contracted for 8 vessels to supply the base. This development has drawn considerable attention in the Japanese tuna industry because Penang already has a joint Japanese-Malaysian tuna base. It was established in 1959. ("Katsuo-maguro Tsushin," February 22, 1967, and other sources.)

South Korea

PLANS LARGE CANNERY WITH U. S. AID

The South Koreans are planning to build a cannery on Cheju Island, off Korea's southern tip, which will have an annual capacity of 1 million cases of tuna and 2 million cases of mackerel. U. S. private and Government capital reportedly will be involved.

The Japanese doubt that S. Korea will have a sufficient supply of raw fish--but they are concerned. The reported capacity of the new cannery is almost half of Japanese exports of canned tuna to the U. S., and over half all Japanese exports of canned mackerel.



Philippines

LAUNCH RESEARCH VESSELS

On March 29, two Philippine oceanographic research ships were christened: the "M/S Researcher I," and the "M/S Maya-Maya."

The 420-gross-ton, Japanese-built, "Researcher I" was acquired by the Philippine Government under the Japanese reparations program at about US$770,000. It is designed

Philippines (Contd.):

to train Filipino fishermen in modern trawl fishing, tuna long lining, oceanic observation and investigation, and research on marine fishery resources.

The "Researcher I" is equipped with a semiair-blast system and contact freezer system using Freon-12 as a refrigerant. It has the latest model equipment for oceanic observation and research, including electronic sounding machine, fish finders, a powerful trawl winch, and line haulers for tuna long lining. There are 4 laboratories: the wet, hydrological, biological, and aquarium and fish laboratory. Living quarters, including those for scientists and officers, are air conditioned. It is the biggest research vessel of the 5 vessels now being operated by the Fisheries Commission.

Second Vessel Built for FAO

The "M/V Maya-Maya" was built in Japan for the United Nations Food and Agriculture Organization under the UN Development Program for training Filipino fishermen in modern purse seining and deep water trawling. The project manager of the UN Special Fund project said the new trawler was acquired for about $255,000. It is equipped with a variable pitch propeller and has an oversized winch to permit deep sea trawling. It is fitted with hydraulic deck machinery and has a main engine of 510 horsepower and 2 auxiliary engines. It also has a hydrographic winch for scientific observations. Other modern fishing equipment included are long-range radio equipment, sonar fish finder, two echo sounders, radar, radio direction finder, and electronic sea water temperature indicator. The "Maya-Maya" has a large refrigerated fish hold and air-conditioned quarters for officers and scientists.

The deputy UN resident representative has announced that another fishing/training vessel, the "Hasa-Hasa," was ordered by FAO from an English shipbuilder. It is expected to be delivered in July 1967. (U. S. Embassy, Manila, April 5, 1967.)

Thailand

WILL BE HOME OF ASIAN FISHERY TRAINING CENTER

The 9-nation working party that met in Bangkok, March 13-17, 1967, to discuss southeast Asian fishery development agreed to establish an Asian fishery training center in Thailand. Representatives of Thailand, Japan, Singapore, Malaysia, India, and Indonesia, and observers from Laos, the Philippines, Vietnam, and FAO, discussed primarily the organization of the center, assessments, privileges, and exemptions.

Assessments ranging from US$1,000-10,000 annually were proposed, but the final decision was scheduled to be made at the cabinet-level meeting in Manila on April 26, 1967. Japan reportedly will assign to the center a new 350-ton training vessel, gear and equipment, and a staff of eight. ("Shin Suisan Shimbun Sokuho," March 24, 1967.)

South Pacific

Australia

WILL CLAIM 12-MILE FISHERIES RIGHTS

The Australian Government will introduce legislation establishing a 12-mile fisheries jurisdiction, the Minister for Primary Industry said in Parliament on March 15. He said it would apply also to the external territories.

He said: "The decision does not involve any increase in the breadth of the territorial sea, which will remain at three miles. The Government has taken its decision in the light of developments in the international law of the sea over the past few years." He noted that many countries have extended their fishing limits to 12 miles: Britain, several Western European states, Canada, New Zealand, and the U. S. New Zealand enacted legislation near the end of 1965; the U. S. in October 1966.

The Minister added: "It is, of course, only right and proper that Australia should take up, and avail itself of, the rights that have become established in this field of international law. There have been suggestions at times that exclusive fisheries rights do not stop at twelve miles and indeed that they extend to all the waters above the continental shelf. The Government's legal advice is that, while the rules of international law enable Australia to exercise sovereign rights for the purposes of exploring and exploiting the mineral resources of the continental shelf as well as certain sedentary fisheries on it, international law does not at present give a coastal country sovereign rights over all fisheries in waters above the continental shelf. In practice, the adoption of a twelve mile limit for fisheries purposes will have the effect of protecting and encouraging the development of the fishing industries of Australia and the Territories. The cray (spiny lobster) fisheries, which are the basis of a valuable export industry, will be given a very substantial measure of protection. The developing prawn (shrimp) fishery and other fisheries will also be assisted. The Government will examine the position of nationals of other countries who have been engaged in fishing in the new zone between the three and twelve miles and will consider whether, as a matter of international comity, a short phasing-out period might be allowed in any appropriate case. Fortunately, so far as both Australia and the Territories are concerned, there is no evidence of any substantial degree of foreign fishing having taken place in the new zone." (U. S. Embassy, Canberra, Mar. 23, 1967.)

* * *

ABALONE FISHERY IS GROWING

Abalone diving, is one of Australia's newest fisheries, is growing in importance. Abalone are collected by SCUBA divers working from launches and small boats. The meat is exported frozen or canned to Asia and the Far East.

Australian production in 1965/66 amounted to 2,924,000 pounds (live weight) worth an estimated A$285,000 (US$318,630) exvessel. The southern coast of Tasmania is the main source of abalone, followed by Victoria, New South Wales, and South Australia. ("Australian Fisheries Newsletter," Feb. 1967.)

Fiji Islands

LEAFLET DISCUSSES 1967 FISHING INDUSTRY

A new BCF leaflet states that the Pacific Fishing Company Ltd. has been operating in the Fiji Islands since 1963 from a freezing and storage base at Levuka on Ovalau Island. The company, predominantly Japanese controlled, has concentrated on catching, freezing, and exporting tuna. Japanese groups interested in the South Pacific tuna fishing industry had long hoped to secure a land base in Fiji to provision ships and store catches. Under the Protected Industries Ordinance, since repealed, the company was allowed to set up a freezing and cold-storage base at Levuka with a guarantee that no other company would be allowed to establish a plant in Fiji. The leaflet also discusses operations, condition of the company, and future prospects.

Note: FFL-112--"The Fiji Islands Fishing Industry, 1967," is available free from the Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.

New Zealand

OFFERS PHASE OUT TO JAPAN
ON FISHING IN 12-MILE ZONE

The New Zealand Government has decided not to join Japan in submitting the question of the legal validity of the former's 12-mile fishing limit to the International Court of Justice at The Hague. New Zealand extended its fishing zone from 3 to 12 miles in 1965.

As an alternative, the Government has consulted with Japan on the possibility of the latter's vessels having a limited phase-out period of fishing within the zone, providing New Zealand's interests are protected.

New Zealand's Prime Minister said consideration of the legal issues had reinforced his Government's views about the legal validity of extending the fishing zone. He added: "While maintaining our legal standpoint we have at the same time opened up with the Japanese Government the possibility of our reaching an agreement to enable their vessels to have a limited period of phase out of fishing in the New Zealand fishing zone provided the arrangement are in a satisfactory form embodying the conditions necessary to protect New Zealand's interest." ("The Japan Times," Mar. 19, 1967, and U. S. Embassy, Wellington, Mar. 21, 1967.)

RADIATION AND FOOD

Consumers are hearing more and more about foods treated with some form of "radiation" to preserve them, or to kill insects or insect eggs, or to prevent sprouting, or to accomplish some other purpose.

They have begun to ask the U. S. Food and Drug Administration (FDA) questions about such "irradiated" foods.

What is radiation processing of food? Radiation, in its basic terms, consists of the sending of energy from a source to an absorber. Heat is a form of radiation and so is sunlight. To this extent, ordinary cooking is a form of radiation processing.

However, the forms of radiation to which the term is usually restricted are electromagnetic "rays" of much shorter wave length than heat and light, called "X-rays," and waves of still shorter wave lengths called "gamma rays." Also used are very tiny invisible particles of matter called electrons.

X-rays are artificially generated by machines similar to those found in a doctor's or dentist's office. Gamma rays are generally obtained from elements which are called "radioactive" because they give off these rays continually, along with tiny particles of matter. When used in food processing, the radioactive element (or "isotope") is sealed in a container so that only the gamma rays can get out. Electrons may be artificially produced by a source something like the vacuum tube of a radio and are then accelerated to higher energy by an electrical field through which the electron passes.

Radiation processing of food, then, consists of the use of X-rays, gamma rays, or electrons on food to effect changes something like the changes caused by heat. Bacteria may be killed, enzymes may be inactivated, and insects may be killed or made incapable of reproduction. ("FDA Memo for Consumers," U. S. Food and Drug Administration.)

AFRICA

Mauritania

NEW 12-MILE LAW OPPOSED BY JAPAN

Mauritania's maritime and fishery law, which was scheduled to become effective March 15, 1967, is expected to seriously impair Japanese octopus fishing off the coast. Under the law, a straight base line will be drawn across the bay in northern Mauritania between Cape Blanc and Cape Temiris, and the territorial sea limit will extend seaward from that line. The territorial waters at some points would extend 40-50 nautical miles from the shoreline and shut out Japanese octopus fishing off the coast of Cape Blanc. The Japanese Government reportedly protested strongly to Mauritania. Japan stated that she cannot recognize Mauritania's unilateral extension of territorial waters. ("Suisan Keizai Shimbun," Feb. 22, 1967.)

Malagasy Republic

U.S.-BUILT SHRIMP VESSEL HEADS FOR MADAGASCAR

On March 23, the "Soavina I," the first of SIPAM's (Societe Industrielle de Peche a Madagascar) proposed fleet of shrimp vessels, arrived at Abidjan from Cayenne, French Guiana, en route to Majunga, Malagasy Republic. After minor repairs, she departed March 25 for Cape Town, South Africa, her only port call before Majunga, where she is scheduled to arrive in early May. This 65-foot Gulf of Mexico-type shrimp trawler was built at Rockport, Texas. She is powered with a 220-horsepower turbo-charged engine, has a daily freezing capacity of two tons, a storage capacity of 35 tons, and reportedly cost US$94,000, complete, at Rockport.

First of a Proposed Fleet

An unconfirmed report said a Madagascar bank had built 50 shrimp boats for use in various parts of the world. It appears likely that Soavina I is the first of a proposed fleet. Whether other vessels are built would likely depend on results of the Madagascar operation.

As the first U. S.-built typical shrimp vessel to stop at Abidjan, Soavina I attracted considerable attention from local fishing interests. (Fishery Attaché, U. S. Embassy, Abidjan, March 29, 1967.)

Kenya

75% OF FISH PRODUCTION COMES FROM 5 LAKES

The Republic of Kenya's 300 miles of coastline yield only about 25 percent of the annual fish production; the balance comes from 5 major lakes. This information is contained in a new BCF leaflet. Kenya's rapidly growing population was estimated at 9.5 million in 1965. For the past 3 years, Kenya has imported annually 1,500 to 3,000 metric tons of fishery products.

The basic method of fishing is by fixed trap, using reeds and chicken wire. To develop and modernize the marine fisheries, a new company was formed--Kenya Inshore Fisheries. The leaflet covers fish production in Kenya for 1964; fresh-water fisheries in 5 major lakes, rivers and dams, and ponds; marine fisheries; shrimp development; Malindi fish market; lobsters; tuna; and cooperatives.

Note: FFL-109--"Kenya Fisheries 1966," is available free from the Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.

Uganda

PLANS 40% FISH PRODUCTION INCREASE

Annual production of Uganda's fresh-water fisheries is about 70,000 tons, mostly tilapia (resembles American sunfish). Government plans call for an increase of over 40 percent by 1971 to 100,000 tons worth about US$20,000,000, by increase in number and production of fish ponds, efficiency of lake fishing, and by improving marketing facilities.

Fish pond development will feature both hybrid tilapia and mirror carp, and the introduction of inboard-powered vessels up to

Uganda (Contd.):

35 feet long equipped either for trawling or gill-netting. Other topics discussed in a new BCF leaflet are: UN Special Fund Project, canned fish, frozen fillets, ice plants, and fishermen's cooperatives.

Note: FFL-108--"Uganda Fisheries, 1966," is available free from the Branch of Foreign Fisheries, BCF, Rm. 8015, U. S. Department of the Interior, Washington, D. C. 20240.

South-West Africa

1966 OUTPUT OF FISH MEAL, OIL, CANNED FISH

Production at Walvis Bay and Luderitz during 1966 was: fish meal, 204,519 short tons; fish oil, 37,846 long tons; canned fish, 133,304,090 pounds.

The catch and condition of snoek in 1966 were described as the best ever. The demand for salted snoek is high and prices good--making it more profitable to export than to can it. Canning of snoek is a considerably more complex and expensive process than canning of pilchards, for example. It is not economic under present market conditions. ("Barclay's Trade Review," Feb. 1967.)

South Africa

BRIGHT PROSPECTS FOR 1967 FISHING

The South African market can take over two million cases of canned pilchards this year, discloses the head of the organizations handling sales of fish meal, fish oil, and canned fish produced in South Africa. Last year the local market took over 1.6 million cases.

The canned fish markets this year tended toward increasing their off-take, especially in the local market. The industry's canning program therefore had been increased substantially over 1966. There were indications that the Philippine Government might permit imports of South African canned fish again this year.

The 1967 price for fish oil dropped from last year's. About half the anticipated production for this year already had been sold to the United Kingdom; the first shipment of about 12,000 long tons was to be taken at Walvis Bay and in the Republic during April. There also had been an increase in the domestic off-take of fish oil, and the industry was negotiating local sales. When local requirements are set, further exports will be negotiated.

The market for frozen spiny lobster in the U. S. remained healthy. The first 1967 shipment of about 20,000 cases of tails was scheduled for mid-March. A similar shipment was to be made about March 22.

Despite bad weather, catches of spiny lobsters have been good.

Fish Meal Market Normal

The market for fish meal was normal this year, although price was somewhat lower than 1966's but still better than in 1965. Last year's abnormal price, described as unhealthy for the industry, had not affected the market.

No difficulty is foreseen in disposing of this year's production. The industry stopped selling to more accurately establish the actual production figure. Sales were to traditional markets, which took the entire production; therefore, it was not necessary to open new markets. South Africa is responsible for 12-13 percent of the world fish-meal market.

Fishing in the Republic during January and February 1967 was good. The catch was about double the same period last year.

A meeting of the Fishmeal Exporters Organization was scheduled to be held in London in April. There, the whole question of fishmeal production and exports would be reviewed again in the light of the latest catches. ("Namib Times," Walvis Bay, South-West Africa, March 3, 1967.)

Senegal

TUNA LANDINGS

This year's tuna fishing season has not been very rewarding for Senegal. In mid-

Senegal (Contd.):

February, only 1,750 tons of albacore had been caught, compared to 2,450 tons landed last year by that date. Unseasonably warm weather is generally cited as the cause. Most of the 21 Basque and 22 Breton tuna boats fishing off the West African coast were inactive in the port of Dakar during March.

The largest tuna cannery, SAPAL, which employs up to 500 persons, suspended operations in early February after processing only 1,800 tons of albacore and skipjack ("listao"). Company officials said the lack of tuna might prevent the firm from resuming production during the balance of this season, scheduled to end in mid-May. (U. S. Embassy, Dakar, Mar. 23, 1967.)

Sierra Leone

1966 CATCH DROPS SLIGHTLY

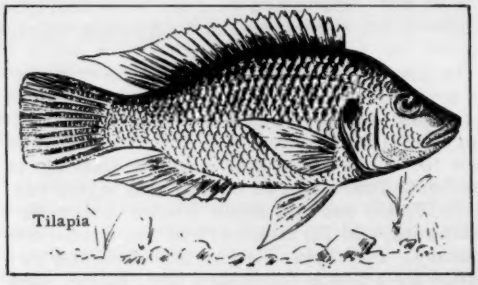
The 1966 Sierra Leone fisheries catch of about 27,000 metric tons was slightly less than 1965's. This was due largely to the repatriation of Ghanaian fishermen who operated from Sierra Leone. An encouraging aspect of the 1966 catch was the increased rate of landings per fisherman. About 18,600 tons were landed by local fishermen using canoes and traditional fishing methods; about 1,500 tons by trawlers. Also, about 6,900 tons of tuna were landed for reexport.

An international team of fisheries experts under the UN Development Program is expected to arrive soon to begin a five-year period of developing Sierra Leone's fishing industry, including a major survey of the sardine resources. (U. S. Embassy, Freetown, March 22, 1967.)

Congo

FISHERIES CONTINUE DECLINE

Congolese fish production has been declining since 1960, a new BCF leaflet states. The abandonment of most industrial fisheries on the eastern lakes, the smuggling of fish into neighboring states, and the lack of transport since independence decreased fresh-water fish production at least 50 percent by 1966. The Congolese Ministry of Agriculture estimates that 1966 fresh-water fish production was 72,000 metric tons. About 23,000 tons were harvested from lakes, largely those bordering the eastern Congo; 28,000 tons



were caught in the Congo River system; and the remainder (21,000 tons) from the rivers of the southeastern Congo, especially the Lualaba River. The most common fish found in the lakes is the tilapia, which resembles the American sunfish. The report also discusses maritime fisheries.

Note: FFL-120--"Congolese Fisheries, 1966," is available free from Branch of Foreign Fisheries, BCF, Room 8015, U. S. Department of the Interior, Washington, D. C. 20240.

ARTICLES

CLAM SURVEY
OCEAN CITY, MARYLAND, TO CAPE CHARLES, VIRGINIA

By Phillip S. Parker*

During the summer of 1964 and the fall and winter of 1965, BCF made a clam survey off the coasts of Maryland and Virginia (Survey Area III). The purpose was to gather information on abundance, distribution, and size of surf clam (Spisula solidissima) and other species found with a potential for commercial use. Samples were taken at 1-mile intervals with a hydraulic jet dredge; 894 stations were surveyed. Catches of $\frac{1}{4}$ bushel or more per minute were made at 55 survey sites. Considerable variation in abundance, distribution, and size of surf clams occurred; these variations are related to bottom type and water depth. Limited beds of ocean quahogs (Arctica islandica) were found in some sections.

To maintain a steady production at present levels, the surf clam resource off the U. S. east coast is being subjected to increasing fishing pressure. Because of concern for future production, the fishery is now being investigated by several agencies: (1) BCF, (2) various state conservation departments, and (3) members of the surf clam industry. To determine the extent of the resource as a basis for future use, SCPA (Sea Clam Packers Association, an organization of members of the surf clam industry), working through the Oyster Institute of North America, initiated and supported a survey for sea clams that was done by BCF off New Jersey and Maryland coasts during summer 1963 (Parker, 1966).

The first survey covered only a small part of the area of interest, so SCPA and BCF agreed in fall 1963 to continue the work in the summer of 1964. SCPA provided funds to outfit BCF's research vessel "Rorqual" (fig. 1) for surf clamming, and BCF supplied the vessel, scientific personnel, and operating funds. From June 1-September 31, 1964, about half the proposed area had been surveyed.

In spring 1964, Congress authorized funds for a Sea Clam Research Program to be conducted jointly by BCF's Exploratory Fishing and Gear Research Base at Gloucester, Mass., and the BCF Biological Laboratory at Oxford, Md. With these funds, 2 additional sea clam survey cruises by BCF's "Delaware" (fig. 2) completed the work in Area III (see Area of Operation). The first cruise was February 19-March 18; the second, November 12-24, 1965. This report covers all results of the survey in Area III.

Fig. 1 - The Bureau's research vessel Rorqual used during the 1964 surf clam survey in Area III.

*Fishery Biologist, BCF's Exploratory Fishing and Gear Research Base, Gloucester, Mass.

Notes: (1) This is Survey Area III.

(2) All statistics are in the appendix to reprint (Separate No. 791) of this article. For a free copy of the Separate, write to Office of Information, U. S. Department of the Interior, Fish and Wildlife Service, BCF, Washington, D. C. 20240.

U. S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 791

Fig. 2 - The Bureau's motor vessel Delaware used during the 1965 surf clam survey in Area III.

AREA OF OPERATION

A large, rectangular area off the coasts of Maryland and Virginia, lying roughly between Ocean City, Md., and Cape Charles, Va., is Area III for survey purposes (fig. 3). The 4 corners of the area are located:

Corner	Latitude N.	Longitude W.
Northeast	38°00'	74°30'
Southeast	37°15'	75°00'
Southwest	37°25'	75°24'
Northwest	38°09'	74°49'

The first surf clam survey agreement between BCF and SCPA called for surveying 4 areas off the New Jersey and Delaware coasts. However, with the later expansion of the exploratory shellfish program in BCF Region III, we included all waters between Cape Hatteras, N.C., and Eastport, Maine, in overall survey area; we divided this area into 10 subareas designated survey areas. The survey areas extend from near shore to about the 30-fathom depth contour (fig. 4). New designating numbers were required for those areas already surveyed to allow each to fall into the logical numbering sequence of the new larger area (from Cape Hatteras, N.C., to Eastport, Maine). The areas originally numbered 1, 2, and 3 became 6, 5, and 7, respectively; area 4 remained 4.

GEAR

During February-March 1964, the Rorqual was converted for hydraulic jet dredging clam survey work. It is 65 feet long, has a 20-foot beam, and draws between 7 and 8 feet of water when fully loaded. Its aft deck is clear and provides a good working area.

A standard 40-inch hydraulic clam dredge was modified for survey work aboard the vessel. The changes were made primarily to reduce the escapement of many smaller clams that could have passed through the openings in the regular commercial dredge. These changes added steel screens to the sides, top, and bottom of the after cage; added steel bars between existing bars of the dredge's knife; and replaced the 3-inch steel rings of the chain bag with 1.5-inch rings.

During the 1965 Delaware cruises (65-2 and 65-10), modified 48-inch (wide) models of the regular commercial hydraulic dredge were used (fig. 5). Distances between steel

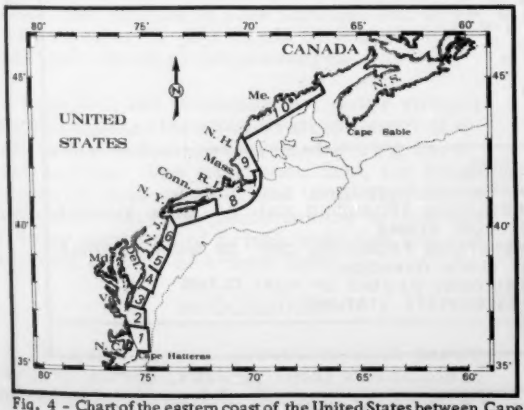


Fig. 4 - Chart of the eastern coast of the United States between Cape Hatteras, N.C. and Eastport, Me., showing the 10 survey areas.

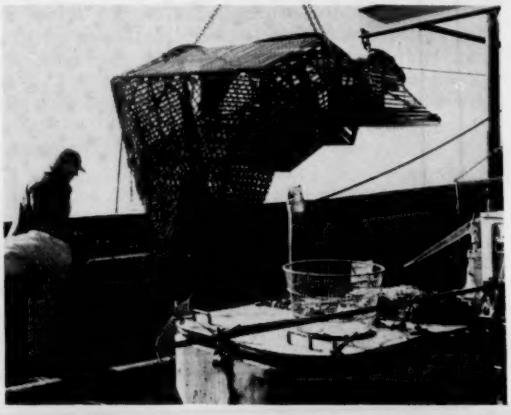


Fig. 5 - Modified 48-inch hydraulic dredge used during the 1965 surf clam surveys.

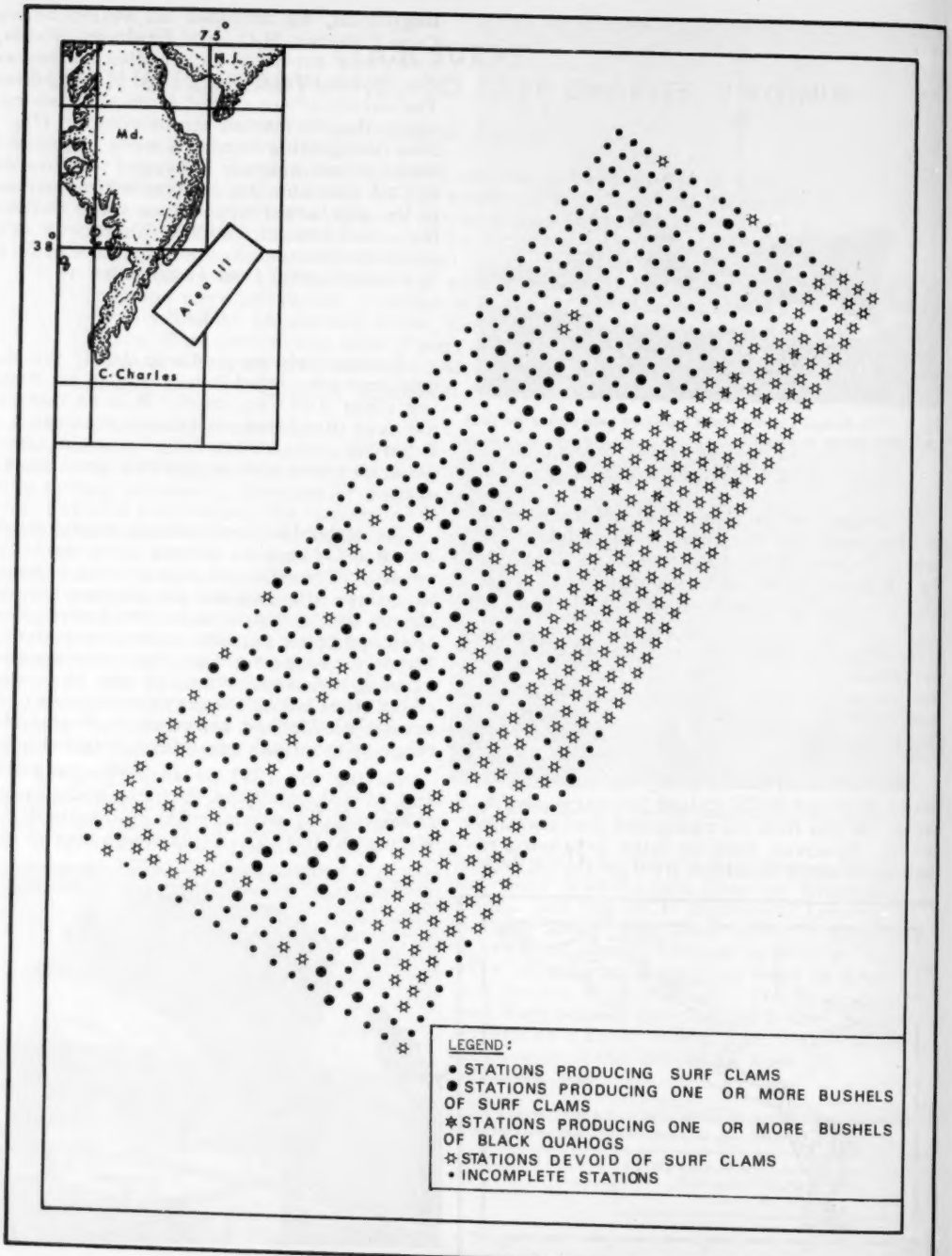


Fig. 3 - Chart of Area III showing survey stations.

slots of the dredge and the cage were reduced from 2 to 1 inch on the dredge used during cruise 65-2. The dredges had small clam retainer boxes built into the after cages for collecting very small specimens. During cruise 65-2, an odometer and thermistor probe were attached to the dredge to measure distance traveled by the dredge and to collect bottom temperatures.

Throughout each survey, an 1,800 gallon-per-minute centrifugal pump was used to furnish adequate water supply for operating the hydraulic dredge to depths of 150 feet. Water, at a deck pressure of 90 to 100 pounds per square inch, was furnished to the dredge manifold through 50-foot sections of either 5- or 6-inch inside diameter clam jetting hose. During cruise 65-2, two parallel lengths of 5-inch hoses were used, but before the cruise's end these were changed to a single 6-inch hose.

Water and pressure measurements obtained from instruments in the discharge line indicated the pump was pumping 1,775 gallons per minute of water through the manifold jets at 80 pounds per square inch manifold pressure (table 1--see note on p. 56) during dredging operations. This proved to be sufficient for successful dredging operations during all cruises.

We were unable to measure the water volume during tests made on the 6-inch hose because of a broken water meter. However, the volume of water (under the same manifold pressure) passing through the jets would be the same as that for an equal pressure measured during the tests on the 5-inch hoses--or about 1,625 gallons per minute for a manifold pressure of 70 pounds per square inch. The volume of flow through one or an equal number of jets would be the same for both tests at equal jet pressures.

In table 1, the pressure and water volume were calculated for an equivalent length of 6-inch hose (190 feet) as that used during the 5-inch tests. The data show that, for those pressures measured, there is no significant difference between performance of the two 190-foot sections of 5-inch hose and the one 190-foot section of 6-inch hose.

PROCEDURE

The same general procedure used during the 1963 survey (Parker, 1966) was followed in sampling Area III. Stations were spaced about 1 mile apart along selected 1-mile spaced grid lines (Loran lines) running north and south through the area (fig. 1). During Rorqual cruise 64-2, 5-minute tows were made at a towing speed of about 1 knot.

The first sampling station was located in the northwest corner (Loran bearings: 1H5-3080, 1H4-3050). Loran-bearing lines spaced at 4 microsecond intervals formed the main north and south grid lines (Channel 1H5). Loran bearings at 12 microsecond intervals positioned the stations along each grid line (1H4). When each tow was completed, the dredge was hauled back and dumped. Clams were measured before the next sampling station was reached. In small catches, all clams were measured; in large catches, an adequate number were measured for length-frequency analysis. Water temperatures, bottom textures, and species composition of catches were recorded.

During Delaware cruises 65-2 and 65-10, the towing time was reduced to 4 minutes or less, depending on bottom type over which tow was being made. At each station, a sample was taken from material collected in the small clam retainer and frozen for later analyses. In addition, on Delaware cruise 65-10, 53 tows were extended to 20 minutes to simulate commercial fishing--to determine size of catch that commercial fishermen might expect.

RESULTS

In Area III, 947 survey sites were occupied. Of these, 894 were standard sampling tows of 4- or 5-minute duration; the remaining 53 were simulated commercial tows of 20-minute duration. Sampling tows during each cruise were: 303 tows during Rorqual cruise 64-2, 397 tows during Delaware cruise 65-2, and 194 tows during Delaware cruise 65-10.

Catches

Of the 894 standard sampling tows, 284 caught no surf clams; 610 took catches varying from one surf clam to 8 bushels of clams. Fifty-five catches contained one-quarter bushel or more of clams per minute of towing--considered the minimum catch rate necessary for commercial use (appendix--see note on p. 56).

Surf clams were taken in 97 percent (295 tows) of the 303 tows made during Rorqual

cruise 64-2. Surf clams were taken in only 68 percent (271 catches) of the 397 tows made during Delaware cruise 65-2, and in 22 percent (44 catches) of the 194 tows made during its cruise 65-10.

Several factors could have influenced these variations in catch rate. These include mechanical and other variants of biological significance, such as: (1) catch efficiency of dredges varied. During Rorqual cruise 64-2, the dredge used for sampling retained surf clams of smaller size than did the two dredges of the Delaware cruises. In sections of Area III containing only small size clams, the probability of catching surf clams in the Rorqual dredge was greater than when using the other dredges. (2) The population density of surf clams (table 2--see note on p. 56) appears to be related to water depth (as well as other factors). In the sections surveyed during Delaware cruises 65-2 and 65-10, the average water depth at the stations was greater than at the station surveyed during Rorqual cruise 64-2. From the abundance-depth relation of previous work, one would expect the number of zero catches from the deep-water sections surveyed by the Delaware to be greater than from the shallower areas surveyed by the Rorqual; this was found to be true.

The lower three-quarters of grid line 10 was chosen for commercial sampling because of good catches there during the survey tows. Only 1 tow of the 53 simulated commercial tows failed to take any clams; 14 caught 5 bushels or more per tow, and the remaining 38 took 1 to 5 bushels. Catches agreed in clam size and distribution for the long tows and the sampling tows made along grid line 10. These results may indicate that the procedure of sampling along a 1-mile grid gives accurate results and adds some credence to the validity of this survey procedure for assessing a resource.

Clam Sizes

The size of surf clams varied from 0.4 to 7.4 inches (10 to 189 mm.). Clams less than 0.4 inch (10 mm.) undoubtedly occur in the area, but the dredges used were not designed to collect smaller clams.

The most abundant size group of clams taken in Area III was between 5.5 and 6.7 inches (fig. 6, table 3--see note on p. 56), the size preferred by the industry for processing. Surf clams over 6.7 inches were rare and clams less than 5.5 inches were abundant, but they were far fewer than those in the 5.5- to 6.7-inch group.

No general pattern was observed as to size distribution within individual catches (table 4--see note on p. 56). Some tows took only clams less than 4 inches, others took only those over 4 inches, but most caught both sizes.

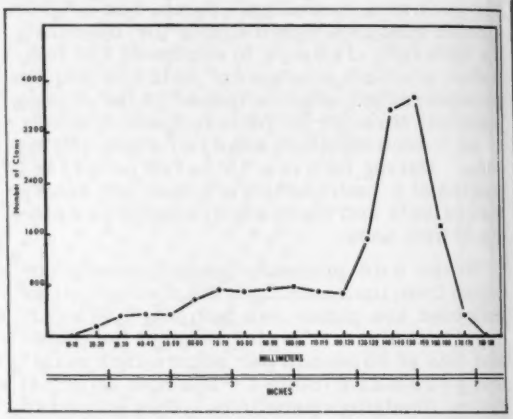


Fig. 6 - Length-frequency distribution of surf clams from Area III.

The length-frequency data collected in Area III do not conform with a normal length-frequency distribution. One would anticipate the number of clams in a smaller-size group to be considerably larger than the number in a larger-size group because of natural mortality. The curve (fig. 6) from our data shows that the number gradually increased from the 15-mm. (0.59-inch) to the 75-mm. (3.0-inch) class groups. After this, a small decrease occurs in the 85-mm. (3.3-inch) class, followed by an increase in the next two 10-mm. increments. The number then decreases to the 125-mm. (4.9-inch) class group, from which a very large increase takes place to the 155-mm. (6.1-inch) class group. The numbers in the following classes fall off sharply to the 185-mm. (7.3-inch) class.

As variable numbers of surf clams below 3.1 inches long pass through the bars of the dredge, the length-frequency curve plotted from our data does not represent truly the number of clams present below that size. The population of surf clams less than 3.1 inches is probably much greater than the data

show. All dredges used were constructed to catch and retain most, if not all, of the clams greater than 3.1 inches. Assuming nearly equal representation for all year classes contributing to the groups above 3.1 inches long, one would expect the number of clams between 3.1 and 5.5 inches to be greater than the numbers of 5.5 to 6.7 inches because of natural mortality.

This kind of population structure is possible if one or more dominant year classes set at infrequent intervals, as Ropes and Martin (1960) suggested for the hard-clam population of Nantucket Sound. However, this does not seem likely for the surf clam because 5.5- to 6.7-inch clams have dominated the population for the past several years. A better explanation may be that surf clams grow rapidly during the first few years of life, then grow slowly for an extended period. Many rapidly growing small clams would enter the slow-growing period, so the number of large clams present would represent the cumulative total of a number of year classes, not a single year class. When the problem of determining the age of surf clams is solved, it may help to answer this question.

Bottom Types

A relation was found between the mean number of clams caught and the bottom type fished (table 5--see note on p. 56). The bottom in Area III was divided into 4 general classifications: (1) sand, (2) gravel, or a combination of gravel and sand, (3) mud, clay, or a mixture of both, and (4) unknown (tows taken where a bottom sample was not obtained). Of the general types identifiable from contents of the dredge, 65 percent were classified sandy, 14 percent gravel, 9 percent mud-clay, and 12 percent unknown. The types arranged with most productive listed first are: (1) gravel, (2) sand, (3) mud-clay. The mean catch from stations with gravel bottom was $2\frac{1}{2}$ times that from sand, and $5\frac{1}{2}$ times that from mud-clay.

Water Depths

In Area III, depths of water fished ranged from 7 to 28 fathoms. The best catches were made between 14 and 18 fathoms (fig. 7, table 2). These data show that the average number in the catches from 10 to 13 fathoms was fairly constant. The catch rate increased steadily between 14 and 18 fathoms, then declined to zero at 25 fathoms.

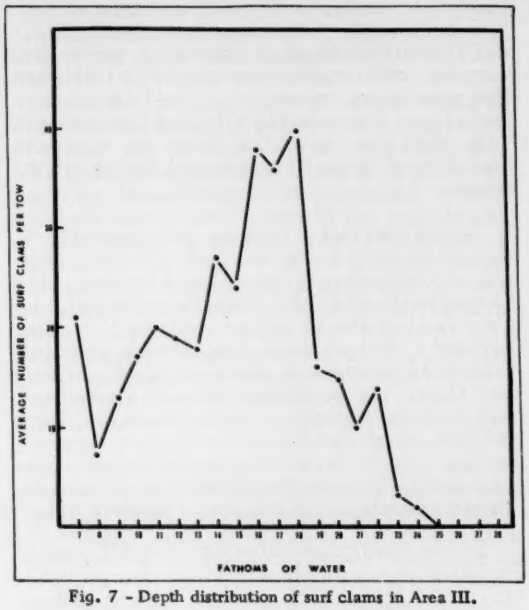


Fig. 7 - Depth distribution of surf clams in Area III.

Data analyzed according to depth increments seem to indicate some relation between depth of water and number of clams caught.

Catch rates by water depth and type of bottom are shown in figure 8 and table 6 (see note on p. 56). These data indicate that for each bottom sediment the best catches were made in those sections where depth varied between 15 and 19 fathoms.

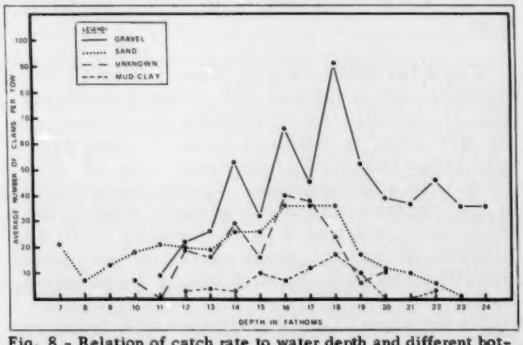


Fig. 8 - Relation of catch rate to water depth and different bottom sediments in Area III.

Populations

Most catches were less than 1 bushel. Generally, the density of clam population was

related to the depth of water and type of bottom sediments. Other biological and physical factors--such as spawning, mortality, current, and temperature--probably influence the population structure. The best catches were taken between the 4th grid line and the 14th grid line, extending from the southern boundary of Area III northward for about 40 miles.

Along the first 4 inshore grid lines (1, 2, 3, and 4), only 6 stations had a catch equaling or exceeding $\frac{1}{4}$ bushel per minute. Although these 4 grid lines included only 11 percent of the 55 better yielding ($\frac{1}{4}$ bushel per minute) stations, the inshore area included 22 percent of the total area. In this section, the population of surf clams was fairly dense in scattered spots; however, they did not equal the density in the better-producing central area described below. The greater percentages of bottom sediments were mud and clay in the shoal inshore area.

In the central section of Area III, which includes the 8 grid lines 5 to 12, the population density was much greater than in either inshore or far offshore sections. The area defined by these 8 grid lines, although including only 45 percent of total area, produced 78 percent of the tows taking $\frac{1}{4}$ bushel or more of clams per minute. The greatest percentages of high-yielding bottom sediments are within this section, overlain by the assumed optimum water depths. All stations that produced catches of 1 bushel or more per minute (up to maximum of 2 bushels) were located within this section. The best possibility for commercial production in Area III is here.

The 6 far offshore grid lines (13 to 18 inclusive), lying beyond the other 2 sections (fig. 1), delimit the remaining 33 percent of the 926 square miles in Area III; they produced the remaining 11 percent of the 55 stations with good catches. The average depth in the section was much greater than in the other two; most of it is covered by 20 to 28 fathoms of water. Most zero catches came from this section. No surf clams were taken deeper than 24 fathoms. The density of surf clams between 20 and 25 fathoms was considerably less than for under 20 fathoms.

The catch rate reflects the surf clam population available to the dredge. Catch data show that the number of clams for any unit of sea bottom is small. At an average towing speed of 1.25 miles per hour, 1,760 square feet of bottom could be covered during a 4-minute tow with a 48-inch dredge. Assume that all clams available were retained by the dredge, and use 60 as the number of commercial size clams needed to fill a bushel measure. At a catch rate of 0.25 bushel per 4-minute tow, there would be an average of one clam per 116 square feet of bottom area. At a catch rate of 1 bushel per 4-minute tow, one clam would be present per 30 square feet of bottom. A density of one clam per square foot of bottom would give a catch rate of 30 bushels per 4-minute tow, or about 150 bushels per 20-minute commercial tow. To our knowledge, this never has been reached during commercial fishing operations. The same process can be used for smaller size clams after adjusting the numbers of individuals in the bushel measure.

Within any area, the density of clams may vary considerably from subsection to subsection owing to spawning mortality, random distribution of the young clam, effects of ocean currents, varying bottom sediments, depth of water, natural mortality, predation, and possibly migration of the clams. While the dredge is operating, it will pass through areas of dense, good, fair, poor, and zero populations of clams in a direct relation to the cumulative effects that environmental factors have had on the establishment of clam populations. Although these factors also affect the population structure of every small geographical subsection, the overall effect is more noticeable in larger areas, such as the middle section of Area III, where the depth and bottom sediments seem to have established the best surf clam populations in the area.

OCEAN QUAHOGS

Ocean quahogs (Arctica islandica) were found in varying numbers--from 1 to 879 per tow at 220 of the 894 survey sites in Area III. The best catches were made where the depth varied between 20 and 25 fathoms (fig. 9, table 2). In shallower waters, they were mixed occasionally with surf clams, but they were never the dominant species in the catch. Beyond 25 fathoms they occurred in intermediate numbers.

Geographically, the best catches of ocean quahogs were along the 25-fathom contour in the area's northeast section, where the bottom generally was quite flat and was com-

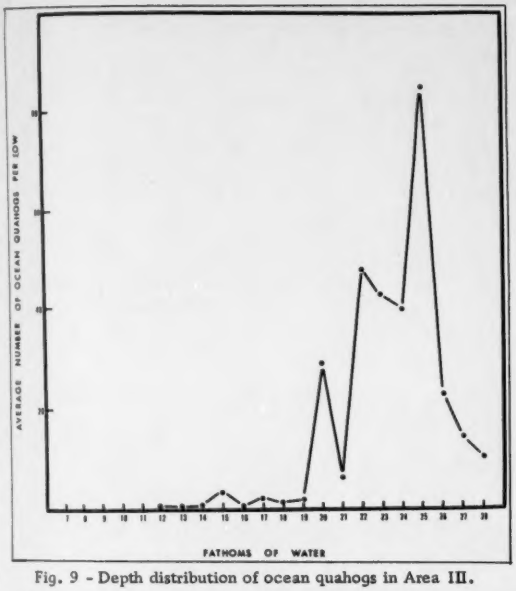


Fig. 9 - Depth distribution of ocean quahogs in Area III.

posed mostly of hard sand. Southward, as the water became shallower, the catches became smaller.

The production potential for this species is good in those sections where they are most abundant (table 7--see note on p. 56). From these sections, commercial fishermen can expect catches of about 15 bushels per 20-minute tow, which is sufficient for commercial exploitation.

PROBLEM OF THE CLAM FISHERY

Harry J. Turner, Jr. wrote in 1953: "A fundamental problem that besets (clam fishery) is that mollusks are extremely erratic in their propagation and variable in their growth and survival. Isolated localities may be phenomenally productive at one time and completely barren for a long period. The gaps in our present knowledge of the chain of events that bring about a mature crop of shellfish are so extensive that the actual occurrence of such a crop appears almost accidental. During the general populations development pattern common to most clam species there occurs a large number of interacting physical and biological factors affecting the survival. The problem of achieving maximum production involves the determination of these factors and assessment of their individual relative importance in the hope that certain factors can either be regulated or controlled to expand the actual production toward the theoretical potential."

Before any intelligent proposal could be made for the establishment of a management program for Area III, most, if not all, factors influencing any surf clam population must be investigated and evaluated. One of the most important factors in the life history of any living organism is its reproduction. In Area III, it seems that some relation exists between the number of large clams (over 4 inches) and the number of smaller surf clams (less than 4 inches) along each separate grid line (table 8--see note on p. 56). Turner (1953) quotes previous authorities as indicating that the reproductive products of one sex may influence the spawning reaction of others so that a chain reaction may be set off. If this situation applies to surf clams, then in those sections of Area III where the spawning populations are concentrated, enormous amounts of spat and eggs could be released into the surrounding water at one time. Based on Turner's (1953) assumption that each mature female produces a million or more eggs annually, the number of young clams available for setting and growth to maturity, even in relatively sparsely populated areas, could be tremendous.

The concentration of small clams as well as large clams in an area add some support to Turner's hypothesis (1953) that, during the surf clams' free-swimming (veliger) stage, their movement may be quite restricted. With increased knowledge of the larval stages and physiology of the surf clam, it might be possible to locate stocks of spawning surf clams in areas of greatest potential.

In any large sea clam producing area, bottom sediment concentrations may affect the size and extent of clam populations. Possibly because of these physical factors, the better concentrations of surf clams are in the central section of Area III. The coarse sand and gravel substrate of this section evidently are ideal habitat for surf clam growth and survival. Although these types of sediments occur in other sections of Area III, they never occur over as broad an area. Of course, it must be remembered that other factors also affect the populations in the central and other sections of Area III.

Turner (1949) states that in Massachusetts the growth of the surf clam varies with locality and year to year, but it is more uniform

than other commercial mollusks. A surf clam may reach $3\frac{1}{2}$ inches in $2\frac{1}{2}$ years; it reaches 4 inches in 5 years. Clams 5 to 6 inches are estimated to be at least 10 years old.

Belding (1910) stated that the surf clam may reach sexual maturity at 1 year, but the first important spawning season occurs in its second year. By 5 years, it would be about 4 inches long.

Studies to determine the age and growth of the surf clam are now underway by the BCF Biological Laboratory, Oxford, Md. Past indications are that the life span of the surf clam is fairly long and growth is rapid only during the first few years. Probably the growth rate of the surf clam in Area III gradually decreases (from the very rapid early growth rate) until it reaches about 6.5 inches, when very slow growth occurs for the remainder of its life span. Only a few clams reach the maximum length of over 7 inches.

SUMMARY

A surf clam survey with 894 sampling stations and 53 simulated commercial tows was made between Ocean City, Md., and Cape Charles, Va. BCF's Rorqual was used during summer 1964 and BCF's Delaware during winter-fall 1965. Originally, the area was designed as Area V, but now has been redesignated Area III.

Considerable variation was observed in size, abundance, and distribution of surf clams. A catch rate of $\frac{1}{4}$ bushel per minute was obtained at only 55 survey sites. Clams were taken at 610 stations; zero catches occurred at 284 sites.

No surf clams less than 0.4 inch (10 mm.) were caught; the 5.5- to 6.7-inch length group dominated the length-frequency curve. A relation was found between number of small and large clams along a single grid line.

Although gravel bottom was not predominant, it produced the best catches of surf clams; sandy and mud-clay bottom yielded smaller amounts.

A close relation was observed between size of catch and water depths; optimum depths occurred between 14 and 18 fathoms.

Simulated commercial tows indicate our sampling method is reliable for assessing surf clam resource.

Smaller and fewer beds of ocean quahogs were found in Area III than in Areas I and IV.

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THE WEST COAST'S SEAWEED INDUSTRY

By Norman W. Durrant*

Webster defines a weed as any undesired, uncultivated plant that grows in profusion and crowds out a desired crop. The term "seaweed" is, therefore, a gross misnomer since many so-called seaweeds are highly useful plants that yield a number of important products. Those most commonly used are the red and brown marine algae.

The earliest records about the use of marine algae are found in Chinese writings of the first century. About 1660, the Chinese introduced into Japan dried algae, which are used as food in many ways. The Chinese and Japanese continue to eat more algae than do any other people. The Japanese eat their seaweeds as regularly as we in the United States eat our tomatoes and lettuce.

Although algae have been harvested for centuries throughout the world, the industry as we know it today stems from the two world wars. During the first, potash and other chemicals were not obtainable from Germany, and both England and the United States turned to the mighty seaweed known as kelp to supply this need. This gave birth to a major industry in southern California. Between 1916 and 1920, over 190,000 tons of kelp were taken. At the close of the war, cheaper sources of chemicals became available, and the kelp industry of California declined.

With the outbreak of World War II, a shortage of chemicals again developed; however, this time the need was for alginates (an extract from kelp) and agar. The various chemicals that had been needed in World War I were not in short supply. The 1940's saw a marked expansion in both harvesting of algae and research to improve manufacturing methods. The purposes of this increased activity were to develop new products and new sources of raw material.

Through many hardships, the U. S. seaweed industry has developed into an important and stable contributor of many products for the food, pharmaceutical, and industrial fields. It is active in New England and on the West Coast.

AGAR

The commercial production of agar began in the United States in 1919, when Chokichi Matsuoka started a business at Tropico, Calif., now part of Glendale. He failed because he could not compete successfully with low-cost imported agar and sold his business in 1923.

In 1940, American Agar and Chemical Company of San Diego, Calif., decided to take up the challenge of developing an agar industry. This effort was spurred by the realization that in a war with Japan the total U. S. supply of vital agar would be cut off.

World War II stressed particularly the need for bacteriological agar. It is the only colloid with characteristics perfectly suited to the development of most microorganisms at temperatures higher or lower or equal to that of the human body. When the war deprived the allied nations of Japanese agar, the U. S. War Production Board alleviated the critical shortage by (1) commandeering and stockpiling all available supplies, and (2) encouraging U. S. companies to harvest red algae and produce agar. American Agar and Chemical Company produced over 90 percent of the entire allied supply; the remainder came from 8 quickly established companies that failed by the end of the war.

The American Agar and Chemical Company is now one of the world's largest producers of agar and the only U. S. producer. It produces about 1,000 pounds of finished product per day; the high quality has been made possible through a strong research and quality control program.

Agar Has Many Uses

The agar sells for $4.00 to $6.00 per pound and about 80 percent of production is distributed primarily to manufacturers of microbiological culture media. It also is used in laxatives because it absorbs and holds water--thus becoming a lubricant and mild stimulant to the intestinal tract. In dentistry, it is one

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of the best materials for making impression molds. Agar also has many uses in food manufacture. It retains moisture and so reduces the rate at which bread and pasteries dry out. In canned meats and fish, it is more stable than animal gelatin. In candies and malted milks, it serves as a stabilizer.

One of the primary problems in this industry still is improvement in harvesting of raw seaweed products for the production of agar. Primitive methods must still be used to harvest the seaweed. Some weeds can be reached with rakes from rowboats or can be gathered by waders at low tide; skin divers, though, account for more. In Mexican waters, harvesting must be done by divers in head-to-toe pressure suits. The high cost of labor in the United States discourages the extensive harvesting of seaweed for agar off our shores. Nearly all of the raw materials for the industry is imported from such areas as Mexico, South Africa, Egypt, and South America.

Several years ago, the American Agar and Chemical Company attempted unsuccessfully to mechanize the harvesting of the agar weed. Until some means of mechanical harvesting can be developed, it is unlikely that significant amounts of seaweed will be gathered off the U. S. coast for production of agar. This country will have to continue to depend on imported raw material.

KELP PRODUCTS

By far the largest producer of seaweed products on the West Coast is the Kelco Company. It produces algin from Macrocystis pyrifera, a species of kelp growing in the offshore waters of the Pacific coast. The many algin products available today are the result of an intensive research, development, and marketing program extending over the past 35 years. Although algin was discovered as a constituent of kelp in 1880, the first successful commercial development was begun in 1929, when Kelco was established in San Diego, Calif.

Algin has many unique properties that make it valuable to the food, industrial, and pharmaceutical fields. Like agar, it is a colloidal substance with the ability to absorb large quantities of water. When a tablespoon of algin is dissolved in one quart of water, the water becomes so thick it can hardly be poured. This unique property is particularly useful in the ice cream industry. The addition of algin to ice cream prevents the water in ice cream from forming coarse ice crystals while being frozen, and the result is a smoothly textured product. Another use is its addition to icing on cup cakes, where it holds the moisture and prevents the icing from sticking to the wrapper.

Algin Has Over 100 Uses

Algin also has unique suspending, stabilizing, emulsifying, gel-producing, film-forming and colloidal properties that make it valuable in other processes. Algin has more than 100 current uses in the pharmaceutical, food, rubber, textile, dairy, adhesive, paper, and other industries.

The West Coast algin industry competes with many natural and synthetic materials, such as gelatin, methyl and carboxymethyl celluloses, gum arabic, gum karaya, gum tragacanth, starches, pectin, polyvinyl pyrrolidone, and polyacrylamides. Despite this increasing competition, alginates are being used more in the United States and abroad. The cost of algin (about $2.00 per pound) is slightly higher than many synthetic colloids, but it is often preferred for its unique properties.

The West Coast kelp industry is highly research oriented. Its scientists are continually seeking new kelp products that will be useful to industry and, at the same time, provide an outlet for natural byproducts of the algin industry. The Kelco Company is now establishing a production unit to extract and process mannitol from kelp. It has been determined that mannitol, a white crystalline alcohol, may be produced from seaweed at almost one-third the cost of making synthetic mannitol. Established markets for this chemical already exist in explosives, electrical industry, paint making, and in the pharmaceutical industry. It is also used in the manufacture of some dietary sweets.

In addition to being used for producing alginates, this giant kelp is used in animal feed. Two Los Angeles area companies, Philip R. Park, Inc., and Kopco, Inc., process kelp for use in various animal feed formulas.

The harvested kelp for animal feed is unloaded into a large hopper and slides into a chopping machine to be ground up and pumped into a large storage tank. It is then pumped

into huge rotary gas-flame dryers, and most of the 90 percent water content is evaporated. Of the remaining 10 percent, one-third is minerals. It comes out of the dryers in the form of tiny, dark-green flakes with a pleasant, salty taste. At this stage, it is valued at about $150 per ton. It is then sacked and sent to various feed manufacturers and blended into animal food products. The meal is used extensively for stockfood throughout the United States, especially in the large agricultural areas of the Middle West.

Besides processing kelp for animal feed, Philip R. Park, Inc., processes various dietary products for human consumption. These include kelp tablets, powder, and an all-purpose seasoning called "SeaZun." These items are used primarily for iodine, mineral, and vitamin supplementation to the diet.

HARVESTING

Unlike agar seaweed, kelp is harvested by a highly mechanized operation. The giant kelp growing in deeper water off the Southern California coast lends itself to mechanical harvesting, which has been used since World War I. Here, a large barge or ship equipped with adjustable mowing sickles moves slowly over the kelp bed. The sickles cut the kelp and pass it to an endless chain conveyer or apron that carries the cut fronds onto the boat. The sickles are set to cut 3 or 4 feet below the surface. This cutting of plants near the surface enables sunlight to penetrate to the younger plants below, stimulating them to grow vigorously. New shoots soon reach the surface and permit the area to be reharvested in 3 to 4 months. The harvesting boats used in the West Coast kelp beds hold 250 to 500 tons of wet kelp.

Many persons believe that kelp harvesting destroys other valuable sea life. This is not true. Marine biologists have established that harvesting kelp does not interfere with other valuable sea life, relatively little of which depends on kelp for shelter or food. The few organisms that do live in the kelp are found in the middle or lower sections of the beds.

California Regulates Cutting

The California Fish and Game Commission strictly regulates the depth of cutting and other harvesting procedures. Only mature beds are cut. When they are ready for harvesting, the kelp plants have a high percentage of mature fronds that grow thickly on the surface of the sea. Most of the mature fronds, if left alone, would slough off and break loose from the parent plant to rot in the water or drift up on the nearest beach.

Harvesting may be compared to a massive pruning of the kelp bed. Many old stems are removed in favor of newer, healthier branches, just as in old land plants. The seaweed are not damaged permanently. The overall condition of the plant from the bottom to the surface of the water is improved because the growth of many new fronds has been promoted.

Kelp beds are not free from conditions that curtail growth or destroy large portions of the beds. For example, "red tide," composed of minute marine organisms, can cloud the waters and deprive the kelp of energy-giving sunlight. A proliferation of coastal atomic power plants intensifies another problem. Sea water used to cool reactors is returned to the ocean. These large discharges can raise ocean temperatures above the level at which kelp can survive. In an effort to solve this problem, studies are underway on the feasibility of transplanting to the affected areas temperature-resistant kelp found off Mexico.

Sea Urchin A Threat To Kelp

One of the most serious problems in the kelp industry is the rapid depletion of kelp beds due to the small but voracious sea urchin. This spiny creature can sever a kelp plant from its holdfast anchorage. This happens quite often because urchin "fronts"--up to 100 urchins per square yard--move across a kelp forest, eating and devastating it. Normally, the kelp can regenerate itself because the urchins move on at about a yard a day. Unfortunately, the urchins in the highly infected areas remain sedentary.

Sea urchin.

Realizing the seriousness of this problem, a Kelp Habitat Improvement Project began operations in September 1962. The project was supported during the first 2 years by grants from the Kelco Company and is now being supplemented by a grant from the San Diego County Fish and Game Commission.

The purpose is to continue the research developed during a large-scale study of the kelp beds, first by the University of California's Institute of Marine Resources, and later by the California Institute of Technology.

These studies were aimed initially at finding an agent for exterminating the sea urchin. Long ago, fur hunters had exterminated the sea otter in the area, the one major predator able to utilize the sea urchin as food. The French control populations of urchins by eating them, but they are not popular in America. Fencing off urchins from the kelp beds was considered--but urchins can climb fences. After considerable trial and error, quicklime was tried on some urchins in the laboratory. This treatment proved effective, while remaining harmless to valuable fish species in the area. The project's researchers hope that a comprehensive liming program, coupled with extensive transplating, will lead to the rejuvenation of many depleted kelp beds.

DIET? TRY IT! -- WITH SEAFOODS

Enjoy dieting? Yes, you can. Diet meals that emphasize fish and shellfish will give you added pep and energy while the pounds melt away. Why? Because fish and shellfish are low in calories but contain high quality, easily digested protein; vitamins; and minerals so necessary for a "top of the world" feeling.

Fish and shellfish have a delicate, distinctive flavor and there are so many varieties to choose from. Snapper is considered one of the choicest of all and in this recipe it is served with real imagination. Marinated in and basted with a tangy, low calorie sauce, the snapper is broiled to appe-tempting perfection. Spicy Snapper will be a favorite with everyone, including the dieters.

This recipe is from a new, 16-page, full-color, diet booklet, Seafood Slimmers, just released by the United States Department of the Interior's Bureau of Commercial Fisheries. It is available for 25¢ from the Superintendent of Documents, Washington, D. C. 20402.

SPICY SNAPPER

2 pounds snapper fillets or other fish fillets, fresh or frozen
$\frac{2}{3}$ cup tomato juice
3 tablespoons vinegar
2 tablespoons salad oil
1 envelope ($\frac{5}{8}$ ounce) old fashioned French dressing mix

Thaw frozen fillets. Skin fillets and cut into serving-size portions. Place fish in a single layer in a shallow baking dish. Combine remaining ingredients and mix thoroughly. Pour sauce over fish and let stand for 30 minutes, turning once. Remove fish, reserving sauce for basting. Place fish on a well-greased broiler pan. Broil about 4 inches from source of heat for 4 to 5 minutes. Turn carefully and brush with sauce. Broil 4 to 5 minutes longer or until fish flakes easily when tested with a fork. Serves 6.

Approximately 130 calories in each serving.

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NOTE: The title of Travis D. Love's article in the April 1967 CFR was distorted when shortened. The full title, as it will appear in the reprints, is: "Survey of the Sun-Dried-Shrimp Industry of the North Central Gulf of Mexico."

UNITED STATES DEPARTMENT OF THE INTERIOR

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Let's Cook Fish!

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in full color from the...

BUREAU OF COMMERCIAL FISHERIES

Fish cookery is easy; the difficulty lies in not knowing how. To help eliminate this problem, the United States Department of Interior's Bureau of Commercial Fisheries has produced *Let's Cook Fish*, a 56-page, full-color publication devoted to consumer education in all phases of fish cookery.

The booklet has explanations and full-color drawings of the market forms of fish; tells how to select and maintain high quality fresh, frozen, and canned fish; how much to buy per serving of all market types (to help the consumer spend food dollars wisely); and includes explanations and drawings for cleaning, dressing, storing, thawing, and cooking fish.

The cooking section tells how to bake, broil, charcoal broil, pan fry, oven fry, deep-fat fry, poach, and steam fish. Selected basic recipes accompany each method of preparation. Also included is a two-page, detailed timetable in easy-to-follow chart form for cooking fish, and a list of tasty, colorful garnishes. Descriptive illustrations and how-to-serve food photographs add color and gayety to this informative book.

Single copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, for 60 cents. Purchases of 100 or more sent to one address receive a 25-percent reduction in cost.